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HUMAN SYSTEMS INTEGRATION COMPETENCY DEVELOPMENT FOR NAVY SYSTEMS COMMANDS

by

Gina M. D. Becker

September 2012

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There is a growing need in defense acquisition to design timely, cost-effective competency development programs to facilitate qualifying new hires to replace a rapidly aging workforce. Navy Systems Commands (SYSCOMs), which are charged with system acquisition and sustainment, are engaged in Total Force Management strategies to support technical competency, development, and qualifications. This thesis examined a Competency Development Model constructed by Space and Naval Warfare Systems Command subject matter experts for Human System Integration (HSI) practitioners at four levels of their careers. The notional meta-competencies required by HSI practitioners were initially reviewed by 10 senior HSI acquisition professionals (representing each of the three major Navy SYSCOMs) and then 24 frontline supervisors to align them with the appropriate acquisition domain, validate the proper practitioner work level where the meta-competency was required, and identify the potential sources for meta-competency development. The results were then compiled for supervisory use in supporting HSI practitioner career development. In addition, an Individual Development Plan for front-line supervisors was constructed to support entry-level HSI employee development. It is asserted that this process can be used by other SYSCOM engineering competencies to identify requisite meta-competencies for practitioner career development and qualification.

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ABSTRACT

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TABLE OF CONTENTS

I. INTRODUCTION....1
A. OVERVIEW....1
B. BACKGROUND....2
1. Human Systems Integration (HSI) and the DAW....5
C. OBJECTIVE....7
D. PROBLEM STATEMENT....8
E. RESEARCH QUESTION....8
F. HUMAN SYSTEMS INTEGRATION (HSI)....9
1. Manpower....9
2. Personnel....9
3. Training....10
G. SCOPE AND LIMITATIONS....10
H. SUMMARY....10

II. LITERATURE REVIEW....13
A. OVERVIEW....13
B. DEFENSE ACQUISITION WORKFORCE (DAW)....13
1. Refining the Defense Acquisition Workforce (DAW)....14
a. DAW Career Fields....16
b. Career Development....17
2. Selection and Placement....18
3. Staffing....20
4. Qualifications....20
C. DAW IN NAVY SYSCOMS....22
1. Competency Aligned Organization (CAO)/Integrated Product Team (IPT) Concept....22
a. Competencies....24
2. Human Capital Management (HCM)....25
3. Total Force Management Concept....26
a. Standard Work Packages (SWPs)....26
b. Standard Skill Package (SSP)....29
c. Individual Development Plans (IDPs)....30
D. OFFICE OF PERSONNEL MANAGEMENT (OPM)....30
E. HUMAN SYSTEMS INTEGRATION (HSI) COMPETENCY....31
F. TECHNICAL WARRANT HOLDERS (TWH)....33
G. SUMMARY....34

III. RESEARCH METHODS....35
A. OVERVIEW....35
1. SPAWAR Initiative....35
B. SUBJECT MATTER EXPERT (SME) INPUT....36
C. POPULATION....37
D. INSTRUMENT....38

E. PROCEDURE 41
F. DATA ANALYSIS 41
G. PROTECTION OF HUMAN SUBJECTS 42

IV. RESULTS 43
A. OVERVIEW 43
B. COMPETENCY DEVELOPMENT MODEL (CDM) CHECKLIST 43
C. FRONTLINE SUPERVISOR SURVEY (FSS) 44
1. Acquisition Domain and Work-Level Assignment 45
D. INTERRATER RELIABILITY 51
E. LEVEL 1 KSA IMPORTANCE RANKING 52
F. LEVEL 1 KSA CURRENT AND PREFERRED SOURCING 53
G. CROSSWALK OF LEVEL 1 KSA AND AE 54
H. SUMMARY 55

V. DISCUSSION 57
A. OVERVIEW 57
B. RESEARCH QUESTIONS 57
1. Required Meta-Competencies for the CDM and HSI Practitioners 57
2. Work-Level Placement for Meta-Competencies 58
C. ENTRY-LEVEL PRACTITIONER DEVELOPMENT 58
D. IDP DEVELOPMENT 59
E. CONCLUSIONS 60
F. FURTHER RECOMMENDATIONS 61

APPENDIX A. ONLINE FRONTLINE SUPERVISOR SURVEY 63

APPENDIX B. SME SUMMARY RESULTS RANK ORDERED BY IMPORTANCE 91

APPENDIX C. FSS ACQUISITION DOMAIN ASSIGNMENT 101

APPENDIX D. FSS WORK-LEVEL ASSIGNMENT 111

APPENDIX E. ENTRY LEVEL IDP 121

LIST OF REFERENCES 125

INITIAL DISTRIBUTION LIST 129

LIST OF FIGURES

Figure 1. Number of DoD civilians in acquisition-related occupational series (1980-2007), drawn from overall DoD civilian personnel (From Gates, 2009).....4
Figure 2. Traditional personnel selection research paradigm (From Schmitt & Chan, 1998).....19
Figure 3. Decisions in the Job Analysis Process (From Mathis & Jackson, 2011).....20
Figure 4. ASN RDA Structural Guidance for CAO (From Hays, 2007).....23
Figure 5. Career life cycle (From NAVAIR 4.6, 2009).....26
Figure 6. Comparison of output improvement when holding work standard (From NAVAIR 4.4, 2007).....27
Figure 7. Total Force Readiness Framework (After NAVAIR 4.6, 2009).....29
Figure 8. Overview of HSI career path; HSI Practitioner experience, training, and education continuum (From SPAWAR, 2011).....33
Figure 9. Competency Development Model Dimensions/Developmental Stages/Job Positions (After SPAWAR, 2011).....36
Figure 10. Respondent's years of acquisition experience.....45
Figure 11. Respondent's years of HSI-related experience.....45
Figure 12. AE Levels 1 and 2 significant meta-competencies for domain assignment.....47
Figure 13. AE Levels 1-4 significant meta-competencies for work-level assignment.....49
Figure 14. KSA Level 1 significant meta-competencies for identification of current and preferred source.....54

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LIST OF TABLES

Table 1. HSI work level 1 AE and KSA meta-competencies 39
Table 2. HSI work level 2 AE and KSA meta-competencies 39
Table 3. HSI work level 3 AE and KSA meta-competencies 40
Table 4. HSI work level 4 AE and KSA meta-competencies 40
Table 5. Average SME ratings for meta-competency criticality 44
Table 6. Percent agreement on work-level placement by section 44
Table 7. Significant AE meta-competencies for domain assignment 48
Table 8. Significant KSA meta-competencies for domain assignment 49
Table 9. Significant AE meta-competencies for work-level assignment 50
Table 10. Significant KSA meta-competencies for work-level assignment 51
Table 11. Fleiss' Kappa for domain and work-level assignment 52
Table 12. Level 1 KSAs ranked by importance 53
Table 13. Crosswalk for level 1 AEs that fulfill level 1 KSAs 55

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LIST OF ACRONYMS AND ABBREVIATIONS

AEs	Assignments and Experiences
ASN	Assistant Secretary of the Navy
AT&L	Acquisition, Technology, and Logistics
BENS	Business Executives for National Security
BS	Bachelor of Science
CAIB	Columbia Accident Investigation Board
CAO	Competency Aligned Organization
CDM	Competency Development Model
CDRL	Contract Data Requirements List
CI	Confidence Interval
CL	Competency Lead
CNO	Chief of Naval Operations
DACM	Director, Acquisition Career Management
DAPA	Defense Acquisition Performance Assessment
DAS	Defense Acquisition System
DAU	Defense Acquisition University
DAW	Defense Acquisition Workforce
DAWIA	Defense Acquisition Workforce and Improvement Act
DAWIS	Defense Acquisition Workforce Improvement Strategy
DoD	Department of Defense
DoDI	Department of Defense Instruction
DON	Department of the Navy
DoNHR	Department of the Navy Civilian Human Resources
DSB	Defense Science Board
ESOH	Environment, Safety, and Occupational Health
FA	functional advisors
FSS	Frontline Supervisor Survey
FY	Fiscal Year

GA-Tech	Georgia Institute of Technology
HCM	Human Capital Management
HFE	Human Factors Engineering
HR	Human Resource
HSI	Human Systems Integration
IDP	Individual Development Plan
IRR	Interrater Reliability
IPT	Individual Product Team
IRB	Institutional Review Board
JCIDS	Joint Capabilities Integration and Development System
KSAs	Knowledge, Skills, and Abilities
KSAO	Knowledge, Skills, Abilities, and Other characteristics
MDAP	Major Defense Acquisition Programs
MHSI-DL	Master of Human System Integration Distance Learning
MS	Master of Science
NASA	National Aeronautics and Space Administration
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NCL	National Competency Lead
NDAA	National Defense Authorization Act
NPS	Naval Postgraduate School
OJT	On-the-Job Training
OPM	Office of Personnel Management
OUSD (AT&L)	Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics
PCD	Position Category Description
PM	Program Manager
PPBE	Planning, Programming, Budgeting, and Execution
RDA	Research Development and Acquisition
S&T	Science and Technology

SE	Systems Engineering
SETR	Systems Engineering Technical Review
SME	Subject Matter Expert
SPAWAR	Space and Naval Warfare Systems Command
SPRDE	Systems Planning, Research, Development, and Engineering
SSP	Standard Skill Package
SWP	Standard Work Package
SYSCOM	Systems Command
TA	Technical Authority
TAE	Technical Area Expert
TFM	Total Force Management
TWH	Technical Warrant Holder
UCSD	University of California at San Diego
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics

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EXECUTIVE SUMMARY

The Defense Acquisition Workforce (DAW) is responsible for equipping and training the Department of Defense (DoD). What makes the personnel in the DAW valuable is their technical knowledge within their career field and competency. The DAW's high volume of work and the retirement eligibility of 18% of its experienced workforce have made the design of a Competency Development Model (CDM) critical to the competency's future. DAW career fields and competencies risk losing their technical experts without having an identified path to develop more technically savvy employees. The creation and validation of a CDM provides a career development roadmap for employees. The Space and Naval Warfare Systems Command (SPAWAR) initiative outlines the knowledge, skills, abilities, assignments, and experiences necessary to develop HSI practitioners capable of meeting the needs of the DoD. This framework was used in further analysis and development of the competency model and the Individual Development Plan (IDP) for employees.

Budget and schedule overruns on DoD programs have caused continual reviews of DAW training and educational requirements. The goal of these reviews is the identification of necessary knowledge, skills, and abilities (KSAs) to adequately fill customer needs. It is critical to an organization's success for it to have accession and career life-cycle planning in place. Competency development adds value to both the organization and its employees.

The Navy Systems Command (SYSCOM) Human Systems Integration (HSI) practitioner IDP was developed in a two-part process. First, the notional SPAWAR CDM was reviewed by subject matter experts to identify any meta-competencies that were not of value for an HSI practitioner. The results from the initial review were then incorporated into the model before the next stage. A survey was sent to HSI frontline supervisors from Naval Air Systems Command, Naval Sea Systems Command , and SPAWAR asking for the domain alignment of each meta-competency and the appropriate work level. Level-one KSAs were reviewed for sourcing and their association to level-

one assignments and experiences (AEs). SurveyMonkey was used to collect the for the initial review, while Excel and the statistical package, R, were used gather data for the in-depth review.

Frontline supervisor participation resulted in 24 responses across the three major SYSCOMs with a range of time for acquisition experience from 0 to 5 years through 31+ years. Of the 77 meta-competencies, participants statistically agreed on the acquisition domain assignment for 38 of the meta-competencies and 23 for work level assignment. Of the 38 domain significant meta-competencies, 33 aligned with HSI, 4 with Systems Engineering, and 1 with program management. Significant work levels were all within the originally assigned work level; no significant changes to work level were indicated. Tables of significant domain and work-level meta-competencies can be found in Chapter IV, Tables 7 through 10. Significance was determined using a binomial hypothesis test on probability $p > 0.5$ with criteria $\alpha \leq 0.10$. Fleiss' Kappa indicated fair agreement between the raters for both acquisition domain, and work-level assignment. Work level 1 KSA current and preferred source assignment was analyzed using a binomial hypothesis test on probability $p > 0.5$ with criteria $\alpha \leq 0.10$. The current source selections had significant agreement on 7 of the 10 KSAs, while only 2 of the preferred sources were significantly agreed on. The cross-walk between level 1 AEs and KSAs was analyzed based on percent agreement for use in the creation of the level 1, entry HSI practitioner IDP.

This research validated the KSAs and AEs required by an HSI practitioner at each work level for a career in the DAW and aligned them to the appropriate acquisition domain. Furthermore, it resulted in the development of an entry-level IDP that can be utilized by HSI practitioners and their supervisors in initial career development and management. This also provides the framework for later research to develop additional IDPs for work levels 2 through 4, continuing the practitioner's career management throughout their career and providing consistency throughout the SYSCOMs for training,

career development, and advancement opportunities. A validated CDM is critical to the success of Competency Aligned Organizations and this process should be replicated for other acquisition competencies in order to develop pertinent career roadmaps for DAW employees.

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I. INTRODUCTION

A. OVERVIEW

Dating back to the inception of military forces there has been a need to select, equip, and train those forces. In order to equip and train, there is a distinct need for materiel solutions; namely, weapon systems and training devices (Builder & Karasik, 1995). The Department of Defense (DoD) procures and manages these items through the Defense Acquisition System (DAS) (DoD, 2007). The DAS is a carefully outlined process in which capability gaps in the national defense are identified and then typically filled with a materiel solution (DoD, 2007). Due to the expense of modern defense systems, the cost of failure is significant, both in terms of procurement dollars and mission capability; consequently, it requires a unique group of highly trained personnel to successfully acquire them (Sharp, 2010). Collectively, the personnel assigned to these critical positions are known as the Defense Acquisition Workforce (DAW). The DAW encompasses a range of management, logistics, and technical fields that aid in the development, test, production, fielding, and improvement of defense systems (Gates, 2009). Within the DAW, Human Systems Integration (HSI) is a vital aspect of the total system approach to procurement (DoD, 2007). HSI practitioner manning and career progression within the DAW has failed to keep pace with the DoD needs, and requires a CDM to accurately and equitably train, educate and expand the level of technical knowledge (Space and Naval Warfare Systems Command [SPAWAR], 2011). This thesis aims to validate the HSI competency model and develop a plan for practitioners to acquire the necessary knowledge, skills and abilities (KSA) to excel at their jobs.

The DAW's technical education and training is critical to acquisition program success. As of January 2010, 16% of the DAW was retirement eligible, and by 2015 another 18% will become eligible (Defense Acquisition University [DAU], 2010c). The DAW has decreased in size by about 14% between Fiscal Year (FY) 1998 and FY2008, where it reached its lowest level. Since 2008, the DAW has experienced growth due to the Secretary of Defense's Defense Acquisition Workforce Improvement Strategy (DAWIS), robust replenishment hiring, and improved retention (DAU, 2010c). The

attention paid to increasing the size of the DAW must be sustained, and there needs to be additional emphasis on hiring the right people for these critical jobs. The current lack of trained and experienced junior grade personnel stems from the early 1990s to the turn of the millennium, when the DAW decreased in size, and there was a hiring freeze (Gill, 2001). Besides shrinking the DAW, not hiring also increased the average age of the DAW. This served to collectively push the DAW closer to retirement, while simultaneously removing the next generation of workers who would have filled vacated positions (Gill, 2001). In 2009, the Traditionalist–Americans, born between 1925 and 1945, and the Baby Boomer generation, born between 1946 and 1964, made up 63% of the DAW (DAU, 2010c). Without an increase in the number and quality of DAW personnel, there will be a critical shortage of knowledge and experience at a time when there is a need for successful development of innovative technologies and war-fighting systems.

A rapid accession plan that classifies and qualifies new acquisition personnel at given levels would help to secure a capable, next generation DAW (Gill, 2001). Various methods exist to achieve a qualified workforce. Regardless of the details of such a plan, there are common issues that all methodologies need to address (Gill, 2001), and would require the identification of critical competencies for each of the specialties involved as well as delineation between the levels of expertise. This thesis proposes a process for the identification of competencies that would be used for recruiting, training, and accessing personnel into appropriate technical positions at given levels, as well as developing a notional mentorship program to capture senior-level expertise before it is lost to retirement. Each competency plan could follow the same general method for design, but would be tailored for different DAW competencies.

B. BACKGROUND

A qualified, stable workforce is the desire of any industry, especially when it involves national defense (Mathis & Jackson, 2011); and, as with any industry, there are many factors that impact the composition of personnel in the DAW. The DAW, however, is especially susceptible to market, industry, and economic volatility (DAU, 2010c). For example, when competing with private industry for recruiting and retaining

personnel, the government is often at the perceived disadvantage that private industry offers higher salaries and better work conditions (Gill, 2001).

Currently, each DAW competency is independently developed by a functional advisor resulting in a lack of uniform accountability for personnel development within the DAW, hindering personnel management (DoD, 2005). Designing and implementing a personnel management plan that offers accountability for the training and performance of DAW personnel could help mitigate the effect that economic volatility has on the DAW (Gill, 2001). Potentially, this could provide greater long-term stability in the DAW and acquisition programs. Since national security depends on the acquisition of effective defense systems, the workforce needs to be appropriately staffed and trained. Competency-based career frameworks within a larger workforce development plan offer the basis for a prepared workforce (Taylor-Mack, 2011).

Personnel levels within the DAW need to be sufficient to fulfill DoD program requirements (Gates, 2009). According to a 2009 RAND Corporation report, one of the top three critical DAW issues is that it is too small for current workloads. Ambiguity surrounding the appropriate way to count the DAW—based on evolving DoD definitions—leaves room for misinterpretation of manning levels (Gates, 2009). For example, definitions have varied depending on whether or not to count contractors or administrative and support personnel as part of the DAW (Sharp, 2010). The RAND report accounted for changes in the DoD definition when they analyzed the DAW. Based on their analysis, the DoD acquisition personnel count peaked in 1992, bottomed out in 2000, and increased through 2007 (see Figure 1). Despite growth from 2000 through 2007, the 2007 count was 14% lower than in 1992 (Gates, 2009). Current DAW manning levels, as well as future declines due to retirement, led the Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics (OUSD[AT&L]) to develop workforce projection models in order to appropriately staff the DAW (DAU, 2010c).

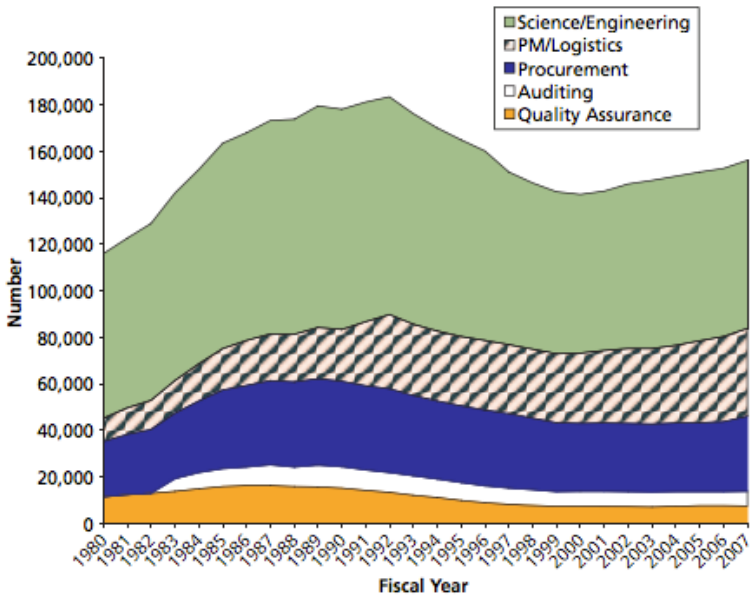

Figure 1. Number of DoD civilians in acquisition-related occupational series (1980-2007), drawn from overall DoD civilian personnel (From Gates, 2009)

The DoD recognized that the DAW was too small for the demands placed on it—as evidenced by Major Defense Acquisition Programs (MDAPs) schedule delays and cost growth—and will increase the DAW by 16% from 2009 to 2014 (Gates, 2009). Growth alone will not solve the issue, for there needs to be accession plans to place new personnel at the appropriate competency level and development plans to support their achieving the required level of performance (Gates, 2009). Further complicating the personnel shortage is the increased complexity of defense acquisition programs and the introduction of the best value approach to acquisition (Gates, 2009). These changes would have strained a fully manned DAW, so their effects are magnified with the shortfall in qualified personnel (Gill, 2001).

The 2009 RAND report identified another concern: the DAW lacks the KSAs needed to accomplish the workload. Quantifying this concern is even harder than determining the size of the DAW. In 2006, the OUSD (AT&L) requested RAND to look into this issue based on their concern that DAW KSA levels may have diminished, leading to a less capable workforce (Gates et al., 2009). With no historical or current DAW-wide qualification-tracking database, a determination on skill level was, at best, inconclusive. Existing data on certification and education levels are also not helpful

without competency-based requirements for positions (Gates, 2009). It is inappropriate to conclude that a particular certification or educational background fulfills job requirements unless these requirements and certifications have been properly defined and vetted. The Defense Acquisition Workforce Improvement Act (DAWIA) provided justification for job qualification standards within the DAW. Three levels of certification (I, II, and III) were created within each of the identified DAW career fields (DAU, 2007). These career-field-level specifications begin to define what is needed to be effective acquisition employees, but further development of subordinate competencies would improve the DAW (SPAWAR, 2011).

Another indication that the DAW was struggling to complete required duties was the steady increase in the government's use of contractors. In the 1990s, contracts became popular due to the push to outsource and the belief that outsourcing saved money (Sharp, 2010). After September 11, contracts were necessary to keep pace with the increased demands in support of the new military conflicts in Iraq and Afghanistan (Sharp, 2010). In 2007, Pegnato, Schoner, and Webb reported an inverse relationship between the number of government acquisition workforce employees and the billions of dollars obligated to government contracts. The concern from these statistics is that the government was relying too heavily on contractors to provide the functions that are, or should be, inherently governmental (Pegnato, Schoener, & Webb, 2007). The contractor or government employee decision is a "make/buy" decision based on factors such as anticipated long-term needs, profusion of demand for the skill, and availability of personnel skilled at that level.

1. Human Systems Integration (HSI) and the DAW

The DAW HSI community suffers from the same shortages of skilled personnel. According to Dr. Robert Smillie, a senior SPAWAR HSI practitioner and subject matter expert (SME), "to maintain and improve the procurement quality from the Navy Systems Commands (SYSCOMs) there is an immediate need for the development and implementation of an HSI competency" (R. Smillie, personal communication, January 6, 2012). It is critical to the success of the DAW that vacated billets be refilled with the requisite caliber of personnel (Sharp, 2010). Most importantly, there is an immediate

need to outline a method to identify and effectively develop required knowledge, skills, and abilities (KSAs) through education and training as well as assignments and experiences (AEs) (SPAWAR, 2011). Such an effort will assist HSI competency managers in the building of Individual Development Plans (IDPs) for HSI employees over the first several years on the job, carrying them from entry-level assignments through potentially SME work (SPAWAR, 2011).

SPAWAR constructed an HSI CDM to support their Competency Aligned Organization (CAO) concept (SPAWAR, 2011). The CDM has specific definitions that represent KSAs, AEs, and the four work levels used in the research. Per *SPAWARs HSI CDM Employee Handbook Version 1.5*, the definitions of these competencies and work levels are provided below.

KSA: outlines mandatory and desired certifications, qualifications, licensures, education, and specialized training required by the competency.

AE: outlines the types of tasks, duties, roles, etc. that an individual should have performed or is performing. Although it may include 'successful completion' of something, it doesn't focus on the individual quality with which an individual is performing those roles. Instead, this dimension captures the experiences that an employee should be having as he or she increases capability within a competency. (SPAWAR, 2011, p .8)

These competency dimensions represent primary focus areas for the CDM. Each KSA or AE dimension is divided into four developmental levels of work: entry, intermediate, advanced, and expert.

The following are descriptions of each of the four developmental levels (SPAWAR, 2011, p. 8):

Entry: This level is the most basic developmental level. It generally applies to individuals who are new to a competency area and are capable of performing well with supervision. Generally, efforts at

this stage involve applying basic concepts and principles with significant support from others.

Intermediate: This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the Individual Product Team (IPT) structure or for leading IPT efforts.

Advanced: This level represents those individuals who are capable of leading and mentoring multiple teams and/or large groups.

Expert: This is the highest level of development within the CDM. At this level, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations.

Advancement through each level indicates an increase in breadth of KSAs, experience, and technical authority/influence. Progression through these levels would ideally occur at the same rate for the various competencies, but this is not always the case. A key aspect of the CDM is its flexibility to allow employees to progress at different rates in the competencies and be recognized for their advancements in each (SPAWAR, 2011).

C. OBJECTIVE

The DAW needs to hire more capable personnel and identify the appropriate education, training, and experiences required for each job to ensure new employees are prepared to complete program requirements. This research strives to identify the necessary KSAs for DAW HSI practitioners to work effectively within each level and progress to the next level. It establishes appropriate methods for acquiring the entry-level HSI KSAs through assignments, experiences, in-house training, and formal education. This work will also provide a generic process to validate and categorize KSAs for the DAW using the HSI competency as an example. In addition, it covers competency dimensions of KSAs for four levels of workers: entry, intermediate, advanced, and expert.

D. PROBLEM STATEMENT

The DoD has high standards for system development to ensure the continued superior capability of its military forces. The DAW's current situation of low manning, undefined skill-set requirements, lack of competency-based training, and reliance on industry contractors threatens Defense Acquisition as a whole. Without an experienced and qualified workforce to handle this mission, the DoD risks losing the military superiority it has sustained for so many years. When hiring new personnel, the DoD needs to ensure they hire capable personnel and that there is a plan to ensure all personnel are educated and trained in the appropriate areas in order to adequately fill the necessary DAW capabilities and emerging customer needs.

The HSI acquisition competency also suffers from personnel shortfalls. The lack of adequately qualified workers across all work levels has caused the same problems for this critical field, as it has with all others in the DAW. Looking at HSI specifically, even more factors threaten the future of these practitioners in the DAW. In addition to suffering from the DAW-wide deficiencies, the HSI competency has specific areas of concern: HSI is not currently available as an undergraduate curriculum; it is interdisciplinary and requires exposure to a broad array of education, on-the-job training (OJT), and experiences.

E. RESEARCH QUESTION

This research is driven by the need to improve the quality of personnel in the DAW, specifically focusing on the HSI competency within Navy SYSCOMs: Naval Air Systems Command (NAVAIR), SPAWAR, and Naval Sea Systems Command (NAVSEA). There are three questions examined in this research:

- What competency dimensions (KSAs and AEs) are required for HSI practitioners in the DAW?
- At which level (entry, intermediate, advanced, or expert) are those dimensions needed?
- How should the identified competency dimensions be acquired at the entry work level?

F. HUMAN SYSTEMS INTEGRATION (HSI)

In reviewing the DAW and HSI competency, this research will deal primarily with the HSI domains of manpower, personnel, and training. The research objective includes identification of the right personnel for the HSI competency, the training required to maintain the quality of personnel, and the manpower needed by the SYSCOMs. In addition to these three main domains, this research also touches on the four remaining domains during the identification of critical competencies and KSAs for HSI practitioners. The additional four domains are Human Factors Engineering (HFE); Habitability; Personnel Survivability; and Environment, Safety, and Occupational Health (ESOH). The following paragraphs describe the domains as described in the FY2009 Naval HSI Plan, and provide a description of its relation to this research (Department of the Navy [DON], 2009). Manpower, personnel, and training are the HSI domains critical to the maintenance of a successful SYSCOM HSI competency.

1. Manpower

According to the Department of the Navy (DON), "Manpower addresses the numbers of personnel (military, civilian and contractor) required, authorized and potentially available to operate, maintain, train, and support each capability and/or system" (DON, 2009, p. 15). For this research, manpower is a necessary component to consider in the trade-off analysis of Navy SYSCOM employees. Not only does the appropriate level of manpower need to be identified to complete the work, but the inventory of available manpower also needs to be tracked and maintained for future usage.

2. Personnel

The DON defines personnel as "the human knowledge, skills, abilities, aptitudes, competencies, characteristics, and capabilities required to operate maintain and support each capability and/or system in peacetime or war" (DON, 2009, p. 15). This research aims to determine the necessary personnel requirements of an HSI practitioner

throughout a career within the Navy SYSCOMs. Meta-competencies, with identified KSAs and AEs, are the discerning categories for separating personnel into the four work levels in this research.

3. Training

Per the DON, "training addresses the comprehensive solutions for content, scope & sequence, facilities, and planning necessary to impart the requisite knowledge, skills, and abilities to the users to effectively operate and maintain systems" (DON, 2009, p. 15). Training for HSI practitioners comes in many forms. This research identifies the necessary areas of training, and makes suggestions as to how that training and education shall be provided in order to keep the workforce current with the required competencies.

The other four domains—HFE; Habitability; Survivability; ESOH—are applicable to this research because this competency development aims to identify the KSAs and AEs necessary for an HSI practitioner to be successful. Thus, KSAs as well as AEs need to be gained for each domain and the competency development must account for them. In order to be effective, HSI practitioners must have KSAs and AEs that cover all of the domains defined here.

G. SCOPE AND LIMITATIONS

Although the manpower shortage is a systemic problem throughout the DoD, this research focuses on the HSI competency within the DAW of the Navy's SPAWAR, NAVAIR, and NAVSEA SYSCOMs.

H. SUMMARY

The value of personnel to an organization is immeasurable. As such, human resources need to be fostered and grown to enhance the overall organization (Mathis & Jackson, 2011). The DAW, and specifically the Navy SYSCOMs, must promote the professional development of their personnel through the appropriate training and ensure they maintain the necessary manpower. These are the basic building blocks to a successful workforce. The remainder of this thesis is organized in the following manner: Chapter II describes this study's review of applicable literature, while Chapter III outlines

the analysis of the research. Chapter IV describes the results of the researcher's analysis, and Chapter V outlines the study's conclusions and recommendations for the future.

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II. LITERATURE REVIEW

A. OVERVIEW

The goal of this literature review is to provide a foundation for the research conducted. The current shortage of DAW personnel and the implications of this shortfall are discussed. The review characterizes the role of HSI practitioners in the Navy's DAW, and looks at recommended KSA categorization to develop competency levels. Finally, it covers the impact of competency development in the DAW, and the implications it has to further develop the HSI competency as well as the careers of HSI practitioners.

The literature review for this research was conducted using a variety of methods. Electronic sources were the most frequently used and included journal articles, DoD Instructions and Directives, the DAU website, and government and government-sponsored publications. In addition to electronic search methods, sources were identified through works cited lists within reviewed literature leading to additional books and presentations. SME recommendations were another source of the literature reviewed and helped ensure appropriate coverage of the material. The following acronyms and key words were used for the research of this literature review: HSI, competency development, KSA, DAW, DAWIA, job analysis, personnel selection, CAO, Integrated Product Team (IPT), SYSCOMs, standard work package, standard skills package, acquisition, Office of Personnel Management (OPM), and IDP.

B. DEFENSE ACQUISITION WORKFORCE (DAW)

DAW is the term traditionally used to describe personnel involved in procurement, program management, research and development, logistics, maintenance, supply, test and evaluation, quality assurance and more (Choi, 2009). Also at times referred to as the "Acquisition, Technology, and Logistics (AT&L) Workforce" or "Acquisition Corps," the DAW's roles, responsibilities, and scope of work are outlined in Section 1701 of Title 10, United States Code. The DAW represents a specific group of

trained individuals, who have heightened standards of certification and expected performance compared to other sectors of government employees (Anderson, 2006).

1. Refining the Defense Acquisition Workforce (DAW)

Governing the defense acquisition process for over 30 years are versions of DoD Directive 5000.01 and DoD Instruction 5000.2. As of November 1990, the DAWIA is the regulatory policy for the DAW (Choi, 2009). Inspiration for the DAWIA legislation came from years of budget and schedule overruns on acquisition programs and a 1986 review of the DAW by the Packard Commission. That commission cited the quality of acquisition personnel as an area requiring improvement: "DoD must be able to attract and retain the caliber of people necessary for a quality acquisition program" (Packard Commission, 1986, p. xxv). Continued education and training of acquisition workers was also cited as critical to the success of defense procurements (Packard Commission, 1986). Ultimately, DAWIA's goal is to create an acquisition workforce that is recognized for its professionalism and fiscal responsibility with public funds (Mavroules, 1991). DAWIA has proven to be the starting point in continued efforts to reform and improve the DoD's procurement process.

Efforts to improve the DAW are based on the well-documented understanding of the value of human capital (Assistant Secretary of the Navy [Research, Development and Acquisition], 2011). Since the November 1990 enactment of the DAWIA, it has been amended to further improve the DAW. These alterations come through National Defense Authorization Act (NDAA) amendments (Anderson, 2006). Some past changes include revised education requirements, authority to establish developmental programs, and increased flexibility to enable DoD to more effectively develop and manage the DAW (Anderson, 2006). These changes aim to improve the corps of personnel responsible for DoD acquisitions since they are the most critical aspect of the process. In a Senate Confirmation Hearing on December 5, 2006, Secretary of Defense Robert M. Gates explicitly stated the value of people.

> Any good employer needs focused recruiting and retention initiatives, competitive compensation and rewards structures, attractive career development opportunities, and education and training programs. The Department must have a vision that

> conveys to the public a commitment to attract and develop the best mix of people, both military and civilian. This vision must be supported by an effective human capital strategy that is actively measured against well-defined goals. (Krieg, 2007, p. 6)

It is not for a lack of understanding the value of a trained workforce that the DAW struggles to achieve a higher level of performance.

Defense acquisition studies from 2005 to 2009 have continued to indicate the need to improve the quality of the acquisition workforce and most cited a need for increase quantity as well (Choi, 2009). The studies that produced these finding are: the Defense Acquisition Performance Assessment (DAPA) report (December 2005); the Report of the Acquisition Advisory Panel (January 2007); the Defense Acquisition Structures and Capabilities Review report (June 2007); and the Business Executives for National Security (BENS) report (July 2009), "Getting to Best: Reforming the Defense Acquisition Enterprise"; and the Defense Science Board (DSB) report, "Creating a DoD Strategic Acquisition Platform" (April 2009). The DSB report was the only one not citing quantity as a concern (Carter, 2010). If the answer is improved quality and quantity of personnel, then the question being answered should be what are the measurement standards of personnel in the workforce?

A 2009 review and analysis of the DAW shifted the focus from just quantity and quality of personnel to specified capability gaps within the organization (Carter, 2010). The Secretary of Defense's DAWIS released April 6, 2009, "places special emphasis on revitalizing the acquisition workforce. This includes right-sizing, re-shaping, and rebalancing the defense acquisition workforce capacity and capability" (Carter, 2010, p. ii). This is more in line with the competency-based career development plan outlined in DoD Instruction (DoDI) 5000.66.

> It is DoD policy that the primary objective of the AT&L Workforce Education, Training, and Career Development Program is to create a professional, agile and motivated workforce that consistently makes smart business decisions, acts in an ethical manner, and delivers timely and affordable capabilities to the warfighter. The AT&L Workforce Education, Training, and Career Development Program improves the capabilities and management of the AT&L Workforce by: developing a highly qualified, diverse workforce capable of performing current and future DoD acquisition, technology, and logistics functions; preparing future key leaders; providing career guidance and opportunities for broadening

> experiences and progression; managing Key Leadership Positions (KLPs) to enhance program stability and accountability; and ensuring effective use of training and education resources. (DoD, 2005, p. 2)

This instruction acts as the framework for workforce improvements to be built around by granting authority and oversight rights to DAW leadership.

In April 2010, refinement efforts for the acquisition workforce presented themselves by way of DAWIS under the FY2009 DoD Civilian Strategic Human Capital Plan Update. With the DoD acquisition mission representing the largest buying organization in the world, appropriate oversight is necessary. Not only is the DAW responsible for a large amount of funding and taxpayer money, but it also plays a large role in national security; which has recently meant more complexity and higher workload demands (Carter, 2010). With no slowing on the horizon for DoD acquisitions, efforts to refine the process are continuous. Improvement efforts share the similarity of identifying the DAW as central to success. From recruitment to career progression and development, the most valuable and important aspect is human capital (Carter, 2010).

a. DAW Career Fields

There are currently career fields that account for work done within the DAW, which include Auditing; Business–Cost Estimating; Business–Financial Management; Contracting; Facilities Engineering; Industrial and/or Contract Property Management; Information Technology; Life Cycle Logistics; Program Management; Program Management–International Acquisition; Production, Quality, and Manufacturing; Purchasing; Systems Planning; Research, Development, and Engineering–Program Systems Engineer; Systems Planning; Research, Development, and Engineering–Science and Technology Manager, Systems Planning, Research, Development & Engineering–Systems Engineering; and Test and Evaluation. Job assignment to one of these fields occurs by matching the acquisition duties to the Position Category Description (PCD) that describes the majority of the acquisition duties (DAU, 2010a).

b. Career Development

The quality of acquisition employees has continued to be at the forefront of the DoD's efforts to improve the quality of the DAW (Carter, 2010). In a 2010 interview, Dr. Ashton B. Carter, then serving as Under Secretary of Defense for Acquisition, Technology and Logistics (USD [AT&L]), stated, "workforce size is important, but quality is paramount" (Carter, 2010, p. i). The emphasis, importance, and an outline for achieving a qualified acquisition workforce have been defined in DoDI 5000.66, dated December 21, 2005, under Section E2.2 AT&L Workforce. The value and criticality of career development is made clear by this governing instruction, which covers a broad range of career development topics such as civilian qualification, competencies, responsibility for competency development and management, education and training resources, as well as certification (DoDI 5000.66, 2005). The overall importance of upward progression of personnel is made clear in the instruction.

The AT&L Workforce Education, Training, and Career Development Program was established as another method of ensuring the workforce capabilities mirrored the DAW needs (Anderson, 2006). The governing document for DAW career development is DoDI 5000.66, which covers the "Operation of the Defense Acquisition, Technology, and Logistics Workforce Education, Training, and Career Development Program." It was signed into effect in December 2005. As described in DoDI 5000.66, the education and training programs are:

> structured to support the continuing professional development of the DAW throughout their careers. These programs support the attainment of acquisition competencies and continuous learning to include updates on evolving policies and procedures. Managers and supervisors are responsible for providing their employees with the opportunity to participate in these DAW career development programs. (DoDI 5000.66, 2005, p. 11)

It supports the DoD by uniformly establishing the structure, policies, and procedures that enable the DAW to achieve and maintain competencies required to serve successfully in DAW positions. The workforce education program attempts to centralize DoD policy and guidance, while decentralizing the execution by DoD Components (Anderson, 2006).

2. Selection and Placement

Prior to focusing on retention and training of personnel, a key to organizational success is selecting the appropriate personnel. According to Mathis and Jackson (2011), selection is "the process of choosing individuals with the correct qualifications needed to fill jobs in an organization" (p. 214). Early investment of time and money in selecting the correct personnel for the job reduces the later burden of managing and trying to train people to get them working at the appropriate level. Also, training is not always able to ameliorate poor personnel selection and costs a company time, money, and lost productivity (Mathis & Jackson, 2011). Clearly, hiring accurately the first time is a much more effective method than attempting to fix poor personnel selection later (Mathis & Jackson, 2011).

For the better part of the twentieth century, the general process for personnel selection has followed the model shown in Figure 2 (Schmitt & Chan, 1998). The job to be filled is analyzed to identify required tasks and responsibilities. Assumptions are then made as to what knowledge, skills, abilities, and other characteristics (KSAOs) are required for persons to fulfill the tasks and responsibilities. Based on the KSAOs, measurements are initially developed and systematically refined to provide an accurate evaluation of performance. The KSAOs are refined through a process of building a hypothesis, testing, and evaluation to determine the most effective KSAOs to use in personnel selection (Schmitt & Chan, 1998).

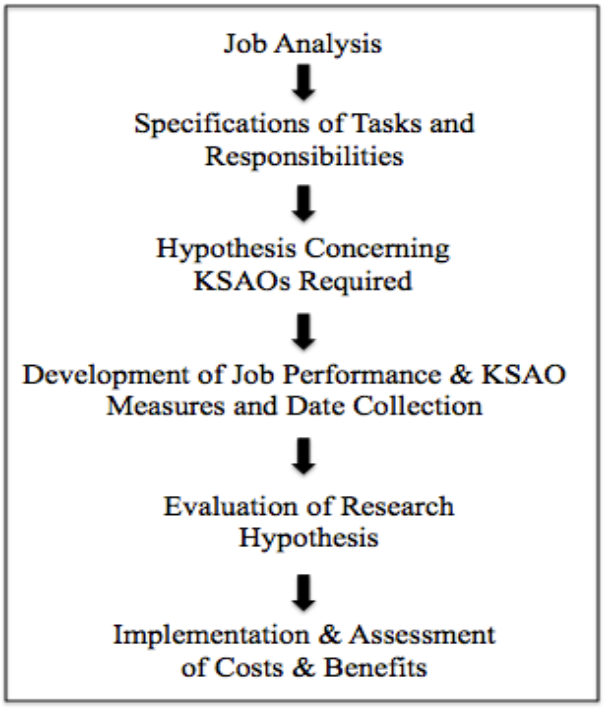


Figure 2. Traditional personnel selection research paradigm (From Schmitt & Chan, 1998)

Appropriate selection is only one component in achieving a correctly matched employee to the needs of an organization; placement is another component that deals with "fitting a person to the right job" (Mathis & Jackson, 2011, p. 214). Placement focuses on an applicant's KSAs and the required characteristics of a job. Correct matching of KSAs to job characteristics results in a good "person-job fit." Prior to being able to match a person to the job characteristics, a job analysis must be conducted to ensure the identified job characteristics are current and applicable (Mathis & Jackson, 2011).

An accurate job analysis is critical to correctly identifying the necessary KSAs. A valid KSA list is achieved by translating the job's required work into a set of KSAs. This is achieved through the research of the task requirements, equipment used, job location, and task variety, and then observing current employees in the job, discussing the job requirements with incumbents, and gaining insight from supervisors who oversee the position and manage the personnel. Figure 3 shows the "who, what, and how" of job

analysis. There are multiple methods, sources, and personnel involved in the process, and it needs continual revision as both jobs and the working environment change (Mathis & Jackson, 2011).

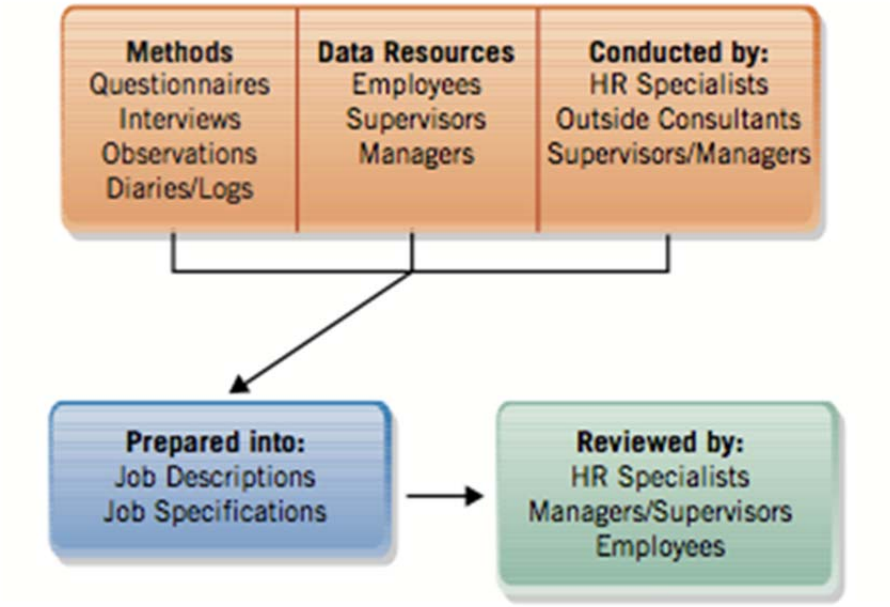


Figure 3. Decisions in the Job Analysis Process (From Mathis & Jackson, 2011)

3. Staffing

Accurate staffing is neither an inexpensive nor immediate process, but it is worthwhile. In their research, Terpstra and Rozell (1993) discovered a significant positive relationship between an organization's employment of staffing practices—recruiting studies, validation of selection criteria, aptitude and ability tests—and annual profit and profit growth. Staffing is one of the key human resource (HR) management functions in support of an organization's productivity, quality, and service. It includes job analysis, recruiting, and selection, and is important throughout all life-cycle stages of an organization. No matter the life-cycle stage of the organization, the goal of staffing is to appropriately fill jobs with qualified individuals (Mathis & Jackson, 2011).

4. Qualifications

As a result of the DAWIA, a certification process was created to ensure the quality of persons working in the acquisition workforce (Anderson, 2006). A DAWIA

certification identifies a person as having achieved a professional status by meeting the educational, training, and experience standards required for a career in any acquisition, technology, and logistics career field (Defense Agency Director, Acquisition Career Management [DACM], n.d.). Assignment of DoD positions to an acquisition career field occurs after a determination that the position falls within the definition of acquisition work (Anderson, 2006). Per the DoD DAW desk guide, the term "acquisition," as it pertains to categorizing a position, is defined as "the conceptualization, initiation, design, development, test, contracting, production, deployment, logistics support, modification, and disposal of weapons and other systems, supplies, or services (including construction) to satisfy DoD needs, intended for use in or in support of military missions" (Anderson, 2006, p. 11). Based on this definition, established defense acquisition career fields include Auditing, Business-Cost Estimating, Business-Financial Management, Contracting, Facilities Engineering, Industrial/Contract Property Management, Information Technology, Life Cycle Logistics, Production Quality and Manufacturing, Program Management, Purchasing, Systems Planning Research Development and Engineering Science and Technology Manager, and Test and Evaluation (DAU, 2007). Within each career field, there are three certification levels: level I (basic or entry level); level II (intermediate level); and level III (advanced level). The assigned level corresponds to the responsibility and expertise necessary to fill the position (Anderson, 2006).

DAWIA certification is only open to DoD employees, and is required at the appropriate position level within 24 months of filling an acquisition position. DAW employees are encouraged to be certified in multiple career fields, but should focus on certification within their current position first. Certification is achieved through DAU course completion as well as experience. In addition, some of the fields also have formal education requirements. The requirements for certification are explicit and nonwaiverable; but once achieved, certification is permanent and transferable to any DoD acquisition organization (DAU, 2010b).

C. DAW IN NAVY SYSCOMS

Navy SYSCOMs manage Navy acquisition programs through full life-cycle support including research, design, development, systems engineering, test and evaluation, repair and modification, in-service engineering, and logistics support (Naval Air Systems Command [NAVAIR], 2012). In order to complete this variety of tasks, the SYSCOMs are organized to increase the responsiveness and maximize their personnel (Hays, 2007). Organizational structure and alignment is the key to fully employing the DAW. CAO promotes collaberation and cooperation on projects as well as reduces the risk level to the governement (Hays, 2007). Integrated product teams (IPTs) are used in line with CAOs to increase team parternship within the organizations and implement the product-focused, life-cycle management (NAVAIR, 1996).

1. Competency Aligned Organization (CAO)/Integrated Product Team (IPT) Concept

A CAO is variation of command organization structure based on focus areas (i.e., competencies) of professional expertise (Hays, 2007). Each competency is based on a common framework of professional KSAs (Hays, 2007). SYSCOMs shifted from the management/functional matrix organization to the CAO/IPT format in order to increase responsiveness to customers (Lockard, 2004). This transition resulted from the Defense Management Review of 1989, which called for streamlining the acquisition process, removing bureaucratic "red-tape," and combining related functions (Osborne, Skinner, & Stickel, 2011). The former Chief of Naval Operations (CNO), Admiral Mike Mullen, recognized the value added through CAOs when he stated, "Developing the workforce based on competencies allows the Navy to continuously evaluate critical skills and create a workforce well-matched to the needs of the warfighters" (Hays, 2007, p. 3). This organizational structure provides flexibility with how DAW talent is employed in the SYSCOMs.

Guidance from the Assistant Secretary of the Navy (ASN), Research Development and Acquisition (RDA) shows how the organizational structure looks in Figure 4 (Hays, 2007). As shown in Figure 4, this alignment ensures that SMEs can enable standardization of processes and tools, yet are still available to functionally

provide services, as needed, to multiple programs throughout their life cycle (Naval Sea Systems Command [NAVSEA], 2009). It also provides organization-wide talent pools with leadership empowered to unite people working on similar projects (NAVAIR, 2011) and increases the effectiveness of DAW members, utilizing their full employment potential.

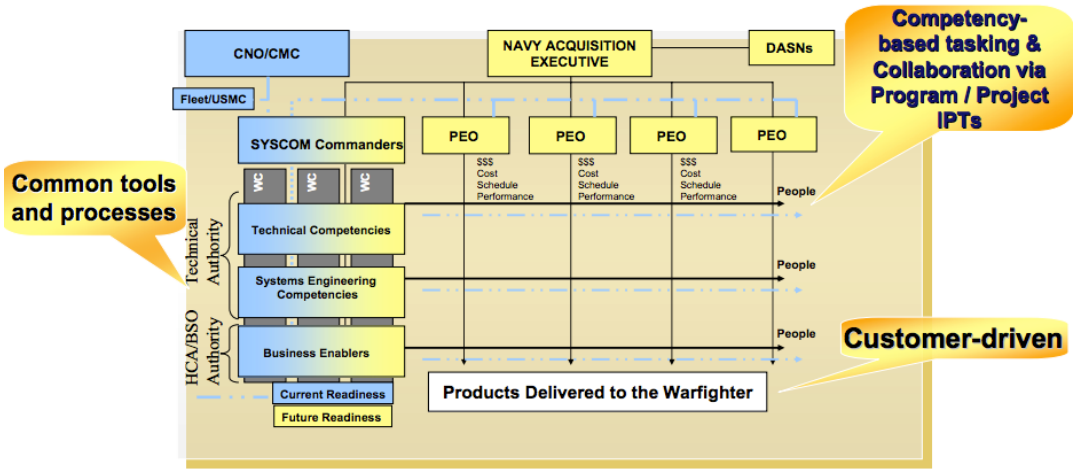


Figure 4. ASN RDA Structural Guidance for CAO (From Hays, 2007)

Here are some benefits from the CAO concept as noted by NAVSEA (NAVSEA, 2009, p. D6):

- Provide greater planning tools to the warfighter, program manager and all stakeholders
- More quickly and accurately mange parts for greater traceability
- Strive to reduce maintenance cost while improving reliability
- Improve data entry, processing and analysis while reducing cost

Overall, the CAO concept is made to focus on the customer's needs and wants. This organizational alignment increases responsiveness while decreasing the customer's risk.

DAW employees also profit from the CAO structure through increased career definition and progression (Hays, 2007). The list below provides a few of these benefits.

- Clearly defined paths for career growth
- Standard processes, "rules and tools" across the command
- A workforce organized around defined competencies that matches workload demands

- Leadership focus on skills and competencies

The command's desire to coordinate the efforts of personnel across the organization leads to standardization of personnel qualifications, training, and career development.

Program manager (PM)-led multidisciplinary IPTs are central to the success of a CAO. Instead of short-lived and limited exposure to a program, these CAO IPTs have responsibility for programs over their life cycle vice a portion of the life cycle and program. PMs also have increased access and control over technical and support personnel. From the customer perspective, these IPTs provide a single, familiar, and responsive point of contact as well as improved control over cost, schedule, and performance. CAO/IPTs empower the PM and the team members to make decisions for their competency (NAVAIR, 2011).

a. Competencies

The word competency without a definition can mean a myriad of things relating to KSAs, motivation, beliefs, attitudes, and values (Shippmann et al., 2000). It could also refer to reliably measurable characteristics, which differentiate performance levels among workers (Shippmann et al., 2000). As defined by the Office of Personnel Management (OPM), whose mission is to recruit and retain government employees, a competency is "a measurable pattern of knowledge, skills, abilities, behaviors, and other characteristics that an individual needs to perform work roles or occupational functions successfully" (OPM, n.d.b, p. 1). Other definitions of competency include verbiage relating to the successful demonstration of KSAOs leading to the accomplishment of a particular work objective (Shippmann et al., 2000). As apparent from all variations of the definition, the requirements to fulfill a competency will differ depending on the job (DON, 2009).

There are also broader and narrower terms associated with a competency. A competency is comprised of meta-competencies (Webster, 2012). Meta-competencies—the specific KSAOs an employee must possess for proficiency within a larger competency framework—are clustered into categories within a competency (OPM, n.d.b). An overarching term that contains competencies is core competency. A core competency refers to "a unique capability in the organization that creates high value and

that differentiates the organization from its competition" (Mathis & Jackson, 2011, p. 41). Meta-competencies combine to make a competency, and competencies provide the capabilities that become the core competencies of an organization.

In Navy SYSCOMs, a competency may be layered or tiered under the broader categories of DAW career fields (DoDI 5000.66, 2005). As defined in DoDI 5000.66, "AT&L Workforce competencies include the knowledge, skills and abilities (KSAs) to shape intelligent business decisions to support the Department of Defense in delivering goods and services to the warfighter" (DoDI 5000.66, 2005, p. 11) The DoD divides the meta-competencies into three categories: leadership competencies, core acquisition competencies that are identified for application across the DAW, and functional competencies that are established for specific DAW career fields. In addition to requirements specified by career field functional advisors (FA), DAW members are also expected to improve their core acquisition, functional, and leadership competencies through continuing education, training, and expanded experiences (DoDI 5000.66, 2005).

2. Human Capital Management (HCM)

Human capital is defined by Mathis and Jackson (2011) as "the total value of human resources to the organization" (p. 18). It would seem intuitive that HCM was the management of these resources and would be defined then by the term "management." HCM is more than just a management style. It is an approach to staffing that looks at an individual's current and future value through educational and training investments (Rouse, 2012). HCM also clearly defines employee performance expectations and links them to specific business and organizational goals (Rouse, 2012). It also maintains employee records, providing a source of current organizational human resource capabilities (Rouse, 2012). The value of HCM to government employees is made apparent by its inclusion in executive development plans. There it is defined as building and managing the workforce based on organizational goals, budget considerations, and staffing needs (OPM, n.d.a, p. 2). It ensures employees are appropriately recruited, selected, appraised, and rewarded, and takes action to address performance problems (OPM, n.d.a, p. 2). All definitions involve streamlining the processes related to personnel, resulting in improved organizational functions (Rouse, 2012). Once an

organization achieves sound HCM it continues to require attention; HCM is not a one-time task, but a continuing process (Mathis & Jackson, 2011).

Despite the overall oversight by OPM, each SYSCOM is responsible for their HCM. Recruitment is the initial stage in an employee's career life cycle with an organization, but it is not the last. Once onboard, continual care and attention needs to be paid to an employee's advancement and progression through their career life cycle. Figure 5 shows a notional image of how these stages fit together. Each of the modules combines to form the career life cycle. Ignoring any of these stages leads to a degradation in both the employee's quality and the company's overall readiness (NAVAIR 4.6, 2009). After the initial recruitment phase, development and knowledge management occur in parallel with retention and managed attrition. All are critical to a successful HCM strategy.

Figure 5. Career life cycle (From NAVAIR 4.6, 2009)

3. Total Force Management Concept

a. Standard Work Packages (SWPs)

Within the career life cycle, SWPs aid with career development and knowledge management for the organization. The CAO/IPT structure allows SYSCOMs to maximize command-wide employee capabilities, but each program still requires a detailed outline to ensure employees are working and training for the correct organizational and program needs. SWPs outline and define the required processes, skills, and resources, and provide continuity for work done. Adhering to a SWP keeps project personnel working towards the same end product and ensures it is useful to the customer. Standardizing a process means being able to identify areas of improvement, further supporting the DoD's devotion to achieving best practices. The SWP represents

the best way to complete a project at a given time, while future employment of that process should continually look for ways to improve and advance the SWP, but with the basic understanding of the original SWP. Figure 6 shows the notional difference in quality of work between standard and nonstandard work (NAVAIR, 2007). The level of work produced is markedly greater when work is standardized vice having to re-learn the same lessons again when work is not standard.

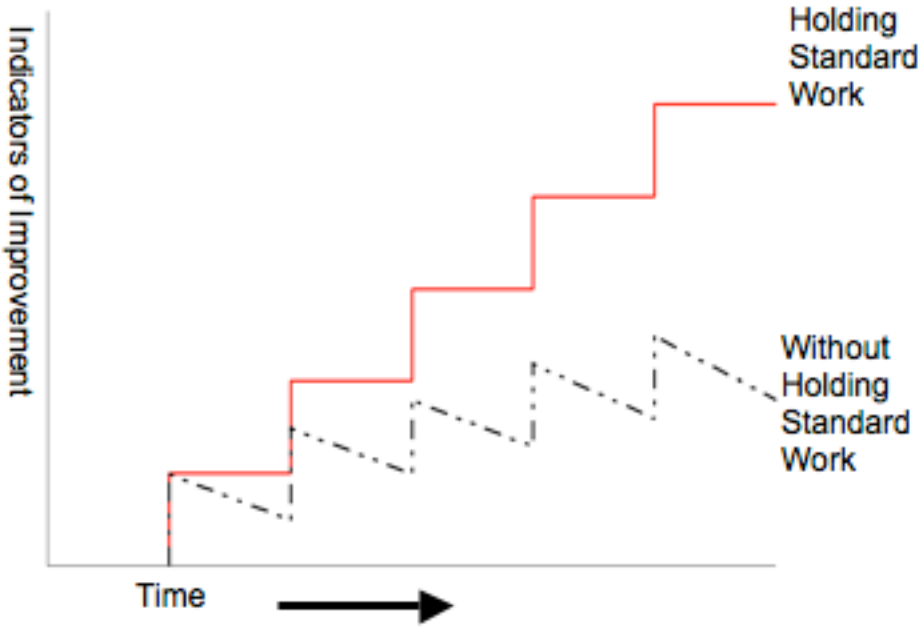


Figure 6. Comparison of output improvement when holding work standard (From NAVAIR 4.4, 2007)

Attributes of standard work include (NAVAIR, 2007, p. 8):

- Clearly identifies the process owner
- Defines product start/stop criteria
- Documents process steps and cycle time
- Provides a way to measure performance
- Shows relationship between cause and effect
- Is a training resource/Delineates training requirements
- Offers a basis of work estimation (labor hours/turnaround time)

Standard work offers a structure to the way work is completed for the organization, including training and evaluation of completed work.

Review of industry practices led NAVAIR to develop a standardized outline for SWPs. The following is the list of SWP sections as well as excerpts from the section explanations.

> 1. Purpose: A brief description of what the standard work is for and why it is needed, who receives the product or service.
> 2. Owner: Identifies the owner by competency code. Any suggested changes or improvements to the standard work would be submitted to the owner for consideration.
> 3. Initiation Requirements: Defines what starts the standard work process. The process begins as a result of an event or the product of another process
> 4. Inputs/Suppliers required: This section identifies the information or products that are required and who supplies these inputs prior to starting the process defined by the standard work.
> 5. Skills Required: The SMEs or specific skills needed to perform the standard work are identified.
> 6. Resources: The resources needed to perform the standard work are identified. The list of resources may range from actual specific equipment required to analytical tools that may be needed.
> 7. Work Steps: Identify the steps required to produce the product or service. The level of detail should be such that an individual with the required skills could produce the product using only standard work. Each work step must identify what is to be accomplished and who performs the work step.
> 8. Completion Requirements: Identify the product or service to be delivered and any additional actions that must be accomplished prior to delivering the product or service to the customer.
> 9. Product Format and Configuration: Define the product or service that the standard work will deliver to the customer.
> 10. Metrics: The metrics will show how well the standard work process is performing and how well the delivered product or service meets the customer's requirements. Required metrics are the labor hours and calendar time to do the standard work. (NAVAIR, 2007, pp. 22–27)

Each part is integral in tying the customer's requirements to the SYSCOM organization, the personnel working the program, and ultimately the end product. The SWP ensures that all personnel involved work towards the same goal.

b. Standard Skill Package (SSP)

After building the SWP, the next step in organizing a successful program is determining the kinds of KSAs needed by the personnel involved and the resources to gain those KSAs. Within the SSP, certification criteria with identified objectives, measurements, and evaluators dictate the necessary KSAs. These objectives may include formal education, training, experiences, or other activities deemed valuable to the required work. Necessary training resources are outlined as well as the associated software, facilities, cost, and timeline (NAVAIR 4.6, 2008).

SSPs are part of workforce development and can be used to enhance an employee's IDP. As shown in Figure 7, there is a linear relationship between the customer's demand definition and the necessary performance objectives for the personnel working on the program. The connecting pieces between the demand and performance objectives are the SWPs and SSPs, which lead to the IDP and ultimately the performance objectives identification.

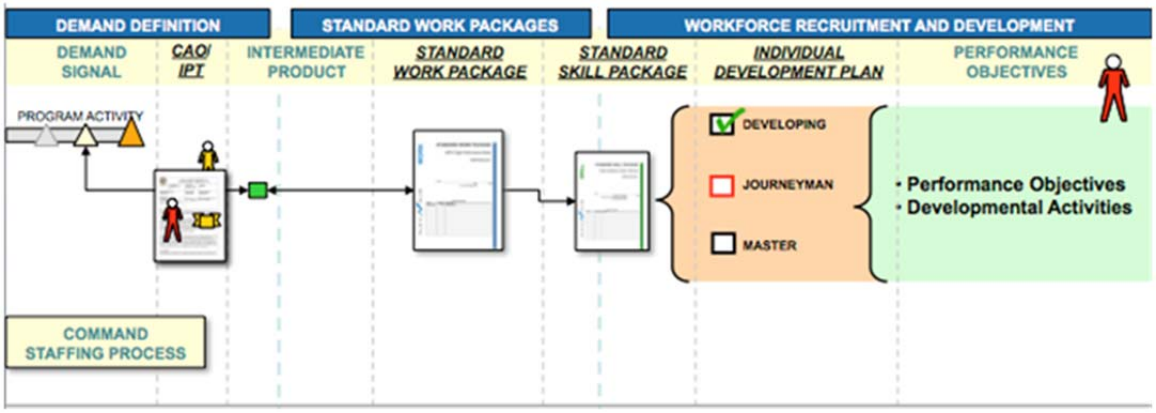


Figure 7. Total Force Readiness Framework (After NAVAIR 4.6, 2009)

In order to fulfill this role of matching employee development to customer needs, the SSP contains five sections.

1. Description of the skill and any prerequisite requirements.
2. Certification criteria including objectives, courses, activities, experiences, and the source of verification for each criterion.
3. References required to successfully develop the skill; templates, instructions, command guidance.
4. Resources required to successfully develop the skill; related SSPs, software tools, lab facilities or other locations.

5. Metrics on the cost and time of acquiring the skill. (NAVAIR 4.6, 2008)

The components of the SSP should function as a roadmap to gaining the specific skill, always relating back to the customer's demand.

The command staffing process must account for the needed employee skills and their career progression, as well as the customer's needs. The SWP and SSP are the intermediary stages linking these needs together, ensuring there is appropriate overlap.

c. Individual Development Plans (IDPs)

SWPs and SSPs are aimed at producing the best product for the customer by utilizing and maximizing the organization's human capital (NAVAIR 4.6, 2009). IDPs ensure that each employee is on the right track for their career in support of the SSPs, SWPs, and CAO/IPTs, and the overall organization (NAVAIR 4.6, 2009). As seen by the Navy, IDPs are a tool provided to ensure that an individual's career is progressing as necessary. It is a "personal roadmap to reach career goals" paved with objectives and career milestones (Department of the Navy Civilian Human Resources [DoNHR], n.d.a, p. 1). According to the DON, an IDP is defined as "a written document used to record the employee's developmental objectives and activities for increasing proficiency, career development and progression" (DoNHR, n.d.b, p. 1). Once created and agreed on by the employee and the manager, the IDP is used as a guide for performance appraisals (DoNHR, n.d.b). Keeping current IDPs ensures that employees and managers agree on future advancements.

D. OFFICE OF PERSONNEL MANAGEMENT (OPM)

Across the government, OPM is responsible for human resource programs and practices of civil service employees (OPM, 2012). Their strategic plan for 2010-2015 aims to support their mission of "recruit, retain and honor a world-class workforce to serve the American people" (OPM, 2012, p. 4). As the governing body of civil service jobs, they write the policy for recruiting, hiring, retention, attrition, and retirement. Commands and agencies may operate within these boundaries when it comes to personnel issues. OPM is available to advise and assist on strategic HR management, but

with the wide variety of command types this is often more effectively planned at the command level. It is the job of command and agency HR to ensure that they maximize their HCM within the OPM guidelines (OPM, 2012). OPM is responsible for the oversight of processes; everything has to fit within their framework, given their general requirements.

E. HUMAN SYSTEMS INTEGRATION (HSI) COMPETENCY

The HSI community within the Navy SYSCOMs recognized the need for a standardized HSI competency under the overarching systems engineering competency (SPAWAR, 2011). During a conversation with Dr. Robert Smillie, an HSI SME, he describes HSI "as an integral part of the total systems engineering approach" (R. Smillie, personal communication, January 6, 2012). HSI focuses on the analysis, design, development, and testing of a product or system in order to maximize Total System Performance and minimize Life Cycle Cost; more specifically, "the HSI competency is responsible for integrating human capabilities and limitations into system definition, design, development, and evaluation in order to optimize human-system performance under operational conditions" (SPAWAR, 2011, p. 4).

In an effort to both adhere to higher authority guidance and meet customer needs, SPAWAR focused on competency development within their organization. In order to maximize the CAO/IPT organizational structure, standardization of required KSAs and AEs for employees serving within the competency is critical. The CDM identifies required training and developmental requirements that will increase the overall employee effectiveness within the competency. Much like a SWP or SSP outlines desired traits for work on a particular program; the CDM delineates the necessary traits for the overall improvement of the competency and employee record. This, in turn, promotes improved responsiveness to customers and product quality (SPAWAR, 2011).

The categorization of HSI billets as part of the DAW means they are subject to DAWIA training requirements. The DAU requirements are included in the CDM, with attention paid to the required material covered so as to not duplicate it from other sources. Upward progression in the competency is derived from a combination of KSAs gained,

experiences, and leadership. Progress assessments and tracking are the responsibility of the Competency Lead (CL), the employee's supervisor, and the employee. Certification for stage completion within a CDM is ultimately the responsibility of the CL; supervisors must gain CL approval before certification can be granted to an employee. While placement within the CDM and certification serve as benchmarks for an IDP, they do not, by themselves, warrant promotions (SPAWAR, 2011).

The CDM is designed with three proficiencies: KSAs, AEs, and Leadership at four levels (entry, intermediate, advanced, and expert). For all stages except the expert stage, the identified KSAs, AEs, and Leadership roles represent exit criteria. Expert criteria represent KSAs, Leadership roles, and AEs appropriate at that level. Simultaneous progression through levels for all three proficiencies is not necessary. It may be determined that an employee has KSAs at the intermediate level, but only entry-level AEs. These placement findings can be integrated in the employee's IDP for the future (SPAWAR, 2011).

Figure 8 shows a notional career progression for an HSI practitioner according to the CDM. As shown in the diagram, there are multiple focus areas important to employee development. The mandatory DAWIA and Systems Planning, Research Development, and Engineering (SPRDE) training should proceed with established DAW requirements. Continued progress in leadership roles and responsibilities is also expected as an employee standard. The HSI competency-specific portions include education, training, and experiences. Each of the respective rows indicates the notional requirements to progress upward through work levels from entry through expert.

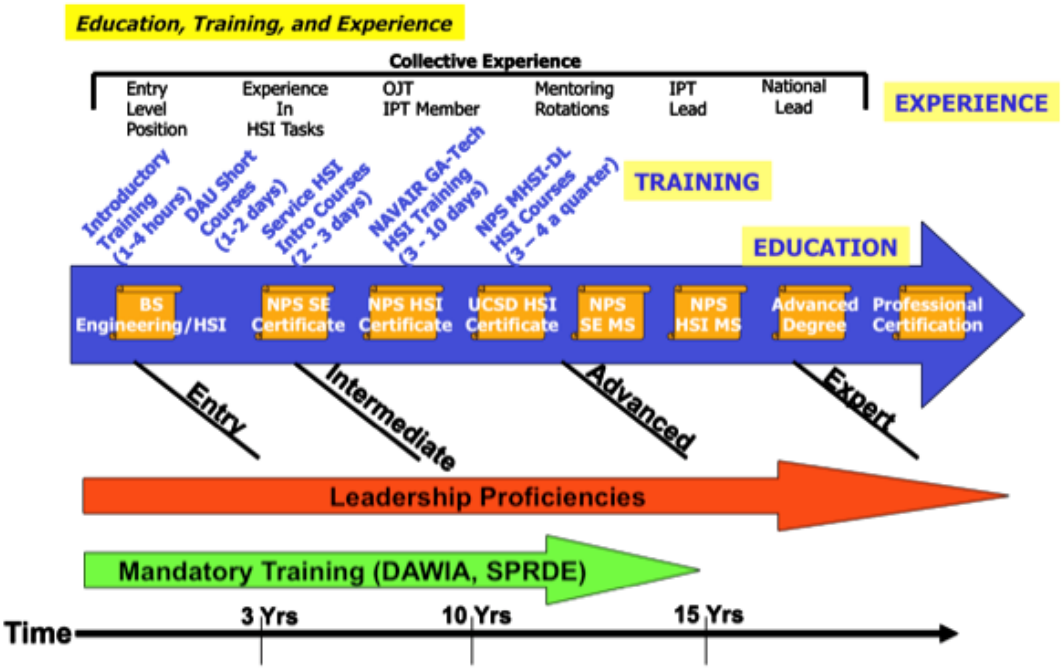


Figure 8. Overview of HSI career path; HSI Practitioner experience, training, and education continuum (From SPAWAR, 2011)

F. TECHNICAL WARRANT HOLDERS (TWH)

In order to provide the necessary level of product and program safety by the SYSCOMs, personnel qualified in the final determinations and oversight of program design are required. Review and authority for this determination is given to a technical warrant holder (TWH) or technical authority (TA). The former NAVSEA commander, Vice Admiral Phillip M. Balisle, described TA oversight as "the most important thing we can do at NAVSEA . . . . TA is that intellectual capital that allows you to operate the Navy safely, to operate equipment and systems the way you should, to maintain standards" (Tropiano, 2005, p. 24). TA gives the TWH oversight, responsibility, and accountability to approve technical products and policy. TWHs are essentially identified as the authoritative experts for the Navy in their designated area (Tropiano, 2005).

The criticality of the TWH position was made apparent by a 2003 independent review by NAVSEA to assess the organization's TA. The 2003 review looked at NAVSEA's TA with emphasis on problems uncovered by NASA's investigation into the Columbia Accident Investigation Board (CAIB) Report (Tropiano, 2005). The CAIB

found that "NASA failed to maintain Independent Technical Authority" and it further explained that "TA is limited unless sufficient people with necessary technical experience and depth are available" (Tropiano, 2005, p. 25). This necessity for qualified individuals highlights the need for a CDM, and identified SWPs and SSPs in support of the customer needs. A vetted CDM would standardize the knowledge of HSI practitioners and continue to promote qualified, certified, and experienced personnel to the level of TWH (SPAWAR, 2011).

G. SUMMARY

The literature reviewed indicates that the HSI CDM is a critical part of Navy SYSCOM program design, development, and testing. HSI is a critical element of the SE process, requiring a standardized qualified workforce with identifiable KSAs to perform the necessary work. The CAO/IPT organizational structure provides a quickly adaptable and responsive structure from which the HSI practitioners can react to the needs of the customer. A developed CDM would enhance the HCM of HSI practitioners in the SYSCOMS and improve both the SYSCOMs' responsiveness and the career progression of the practitioners. The value of an HSI CDM is apparent and SPAWAR was successful at the creation of a notional CDM. This research intends to validate these past efforts.

III. RESEARCH METHODS

A. OVERVIEW

This was exploratory research of the DAW HSI workforce, conducted using a survey as the instrument. The intent was to develop a validated list of KSAs and AEs for Navy DAW HSI practitioners at each level in their career and a prioritized list of entry-level KSAs and identified avenues to acquire them. It leveraged the knowledge, experience, and opinions of HSI SMEs, managers, and practitioners to validate a preliminary competency development plan created by SPAWAR. This research finalized and validated the original SPAWAR KSA and AE list by soliciting inputs by HSI competency supervisors charged with overseeing HSI activities and developing HSI practitioners. It also expanded on previous research by identifying training and education sources for the level 1 practitioner. A research protocol was submitted to the Institutional Review Board (IRB) prior to collecting human subject data and approval was received under protocol number NPS.2012.0059-IR-EM2-A.

1. SPAWAR Initiative

The SPAWAR competency model is built with three focus areas and four levels. The three focus areas are KSAs, AEs, and Leadership. The four levels are entry, intermediate, advanced, and expert. A notional diagram of the competency is shown in Figure 9 (R. Smillie, personal communication, January 6, 2012). For this research, the list was modified to exclude the leadership category; choosing instead to focus on what is needed to perform the job that can be demonstrated through qualifying experiences, education, or training.

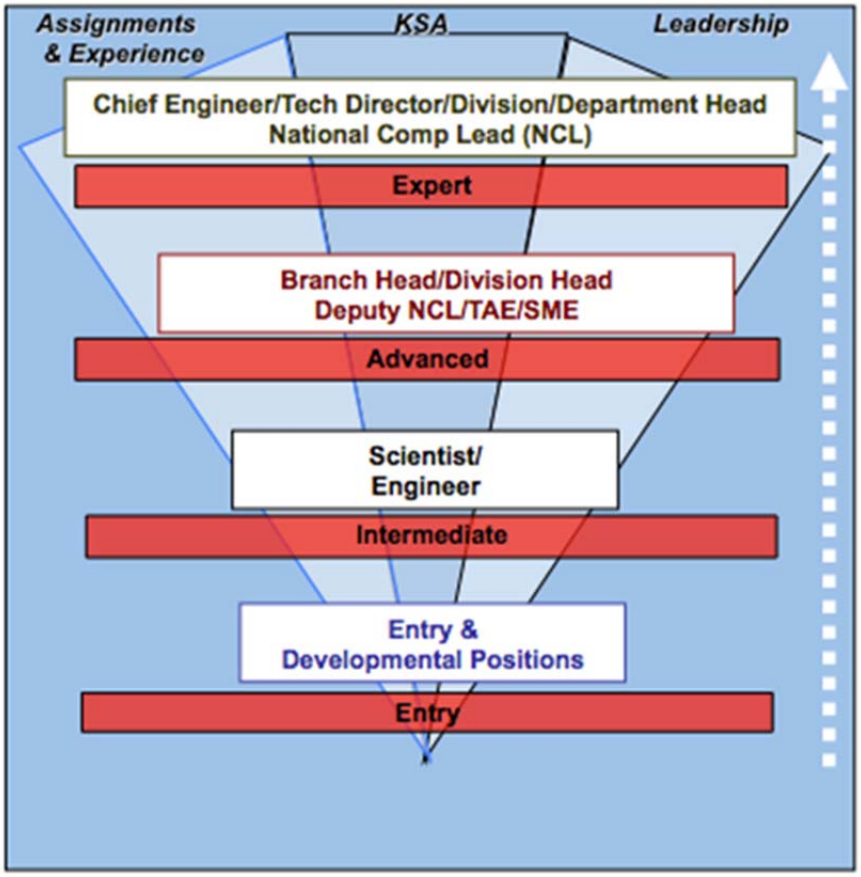


Figure 9. Competency Development Model Dimensions/Developmental Stages/Job Positions (After SPAWAR, 2011)

B. SUBJECT MATTER EXPERT (SME) INPUT

Leveraging the competency development by SPAWAR, HSI SMEs from the DoD, Homeland Security, and the National Aeronautics and Space Administration (NASA) provided input on HSI meta-competencies and their assignment to work level. To facilitate SME rating/classifying meta-competencies, the basic checklist format was slightly modified. An IRB review of this preliminary effort was conducted and it was determined that it did not constitute human subjects research. However, participation by each SME in the competency alignment checklist was strictly voluntary and no effort was made to analyze individual inputs.

The meta-competency checklist provided background information as well as directions for survey completion. The instructions provided definitions of the work

levels according to the SPAWAR HSI CDM Handbook. These definitions provided consistency among the SMEs' understanding of each work level. The criteria for each work level mirrors the SPAWAR-identified competencies for an HSI practitioner. Criteria for each level were split by KSA and AE. Each SME was asked to rate the criterion on a scale of importance for a practitioner. The scale ranged from 1 (not valuable) to 5 (very critical). A follow-on question asked the SME to identify which work level that criterion is required in, if not currently listed in the appropriate level.

The HSI SME input offered a critical competency review by personnel working in the upper levels of the SYSCOMs and validation of the identified meta-competencies. This pilot study provided the overall group opinion on the identified competency traits and pointed to areas of concurrence or dissent with the preliminary competency development plan. Input from the SMEs was used to prepare the survey for HSI supervisors in the Navy SYSCOMs and allowed more in-depth questions to be asked of the already verified meta-competencies.

C. POPULATION

There were two separate groups of participants in this research: the DAW-wide HSI SMEs that offered input on the initial list of competencies and the SYSCOM HSI frontline supervisors who reviewed the final competency list as experimental subjects. Within the DAW, this research looked specifically at the HSI departments in Navy SYSCOMs. Interservice definitions of HSI vary due to service-specific needs. Therefore, this research focused within one service, the Navy, to provide continuity when surveying the HSI managers.

The survey instrument for this research was provided to the current frontline supervisors of HSI practitioners within the Navy SYSCOMs (SPAWAR, NAVAIR, and NAVSEA). This was a whole population study, which aimed to survey all of the approximately 20 frontline supervisors across these three SYSCOMs. The SMEs provided the high-level perspective of HSI within the SYSCOMs, whereas the frontline supervisor's perspective offered a trench view from people who manage and write the

IDPs for current HSI practitioners. The range of the participant perspectives provided both a top-down and bottom-up review of the competencies to ensure valuable attributes were not overlooked.

D. INSTRUMENT

The final Frontline Supervisor Survey (FSS) began with the initial SPAWAR listing of meta-competencies and incorporated the SME review and input. A step-wise process produced the final survey: (1) The SPAWAR competency dimensions; (2) creation of the SME checklist; (3) SME review of the dimension checklist; (4) analysis of the SME checklist inputs; (5) development of the final survey; (6) limited fielding of the survey to a focus group to check survey comprehension; and (7) full fielding to frontline supervisors. Thus, the final survey questions were based on the SPAWAR competency development as well as information gathered from the SME checklist. Final survey preparations include modifying questions, rewriting instructions, checking the overall survey instrument, and formatting for mass distribution to SYSCOM HSI frontline supervisors.

The first part of the survey required participants to provide consent and confirm their position as an eligible participant. The second part asked participants to review each of the 77, SME-verified, HSI meta-competencies and to indicate with which acquisition domains they most closely align. These meta-competencies are arranged by AE, KSA, or work level in Tables 1 through 4. The offered acquisition domain options were: HSI, SE, Program Management (PM), Science and Technology (S&T), and Other. The third part of the survey asked participants to review the entry-level competencies and assess each for criticality on a scale of 1 to 5 (noncritical to very critical) and frequency of application on a scale of 1 to 5 (less than once a year to daily). The fourth part of the survey asked participants to identify where each competency can be acquired. The options included: in-house training, DAU courses, formal education, and OJT. In that same section, participants were asked to select their recommended training/education source from a drop-down menu of the aforementioned locations. The fifth part was a crosswalk of each of the entry-level competencies (KSAs) with the identified entry-level

assignments and experiences to establish which leads to its respective competency development. The survey gathered minimal demographic information based on organizational membership, years of acquisition experience, years of HSI experience, and DAWIA certification field and level. The complete FSS can be seen in Appendix A.

AE Level 1	KSA Level 1
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	Undergraduate degree in Engineering or HSI-related area.
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	Knowledge of the acquisition process/policy.
	Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.
Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	A beginning knowledge of purpose and process of technical analyses.
Experience in executing tasking using HSI standards, best practices, and other techniques.	Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.
Experience with cost control, configuration management, design reviews, and life-cycle perspectives.	Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.
Performance/Demonstration (3 years experience): Participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing systems engineering procurement package development, evaluating and reporting on Contract Data Requirements List (CDRL) input from contractors. Skilled in analysis techniques, including Gap, Trade-Off, and Trade Space Analyses. Ability to conduct studies and analyze results.	Completion of DAU Acquisition 101 (web based) for all competency personnel.
	Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).
	Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.
	Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.

Table 1. HSI work level 1 AE and KSA meta-competencies

AE Level 2	KSA Level 2
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.	HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)
Participate in a cross-domain IPT.	
Provide technical leadership for HSI deliverables within an IPT.	Systems Engineering Certificate (desired). (NPS four course certificate program)
Increase exposure to other competencies. Providing support to a non-HSI competency effort to produce an IPT deliverable.	In-depth knowledge of job related HSI domain levels.
Perform interface with the fleet customer or sponsor on technical issues.	Understanding of HSI domain relationships with acquisition and the systems engineering processes.
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.	Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.	
Applies Engineering and Psychology as it relates to knowledge engineering, training, teamwork, and user interface design and decision sciences to properly influence relevant documentation.	Knowledge of human performance measurement and ability to measure it.
Intermediate Level Learning/OJT (e.g. Mature level of hands-on participating, mentoring Entry Level, and further developing KSAs in Systems Engineering, Logistics, Project Management, Acquisition, and Supply Support.)	Familiar with organizational structure and current status of the user community which they are currently assigned to support.
Performance/Demonstration (10 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing SE procurement package development, evaluating and reporting on CDRL input from contractors.	Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).

Table 2. HSI work level 2 AE and KSA meta-competencies

AE Level 3	KSA Level 3
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.	Completion of an advanced technical degree, MS-SE, MS-HSI, or related advanced degree (desired).
Serve as a HSI technical consultant and advisor for a particular technology area.	In-depth and working level knowledge of SE, HSI, and program/project management
Experience providing HSI technology projections for a particular area.	Leadership development (alliance development for influence in HSI community).
Experience with technology transition.	
Experience dealing directly with the customer or end-user.	Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.
Performance of technical mentoring for other HSI Competency assigned personnel.	
Leadership of a Community of Interest or Mission Area Team (desired).	Completion of project management training and/or industry certification, such as project management professional (desired).
Participation on a cross-SYSCOM or organizational IPT or significant exposure working with other organizations to address technical challenges (desired).	
Demonstrate advanced oral and written skills by authoring/co-authoring peer-reviewed journal articles, briefings to senior executives, etc.	Detailed knowledge of Acquisition Process, including Systems Engineering, Logistics, PPBE, and JCIDS.
Serve as the lead of an HSI team/project for 1 year.	
Participate on a source selection panel for a competitive contract (desired).	Knowledge of law and Government, relating to acquisition and human capital management.
Designation as an HSI Technical Warrant Holder (desired).	
Aligns HSI efforts to support objectives on behalf of the war fighter.	Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.
Works to improve the DAWIA/SPRDE-SE process regarding HSI practices.	
Demonstrates authoritative execution, revision, and implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.	
Demonstrates Advanced Level Learning/On the job experience. (e.g. Revising existing and developing new HSI policy, consultation/mentorship, training the workforce, developing improved HSI products and tools, managing Entry and Intermediate level HSI staffs.)	Ability to manage resources, assess and manage HSI impacts and risks, and evaluate and provide HSI inputs to contract clauses, deliverables, and budgets.
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, writing papers, discussion panels; influencing leadership at highest levels of management.	Familiar with challenges, needs and objectives facing the user community which they serve to include arrangement and order of commands to which they are subordinate.

Table 3. HSI work level 3 AE and KSA meta-competencies

AE Level 4	KSA Level 4
Create technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.	Completed Executive Management Training (desired).
Forecast competency demand signals for HSI.	
Develop and implement strategic vision for HSI.	
Developing KSA and assignment/experience requirements for HSI.	
Author peer-reviewed journal articles on HSI.	Post MS courses in SE and HSI (desired).
Assigned as a Technical Area Expert in HSI.	
HSI competency lead.	
Nationally recognized leader in HSI.	
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.	
Serves as Division Head or Senior Technical Staff responsible for HSI personnel.	Participates in continued technical education.
Answers HSI needs and objectives of the user community.	
Approval authority for meeting DAWIA requirements within the HSI competency.	
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.	

Table 4. HSI work level 4 AE and KSA meta-competencies

E. PROCEDURE

The survey was administered via the Internet on SurveyMonkey, which is commercial software that enables users to create, administer, and analyze a survey and the information gathered from it. A pilot survey was conducted using resident HSI students enrolled in the Naval Postgraduate School (NPS) HSI master's program to ensure clarity of survey directions, questions, and overall operability via SurveyMonkey.

For the main research, participants received an email invitation to participate. The subject of the email was "HSI Competency Development." This email explained the need for competency development, as well as the anticipated rewards for the HSI community, Navy SYSCOMs, and the DAW. When they selected the provided link in the email it directed them to the survey and the consent form, which provided a brief research overview, as well as the potential risks and benefits of participating. By selecting the "Next" button they gave consent to participate and SurveyMonkey directed them to the eligibility-screening portion, reminding them that Supervisors are the desired target population. Participants who began taking the survey had the option to quit and exit the survey at any time they wished to do so and they could also choose to stop and return to the survey at a later time. The survey was expected to take approximately 30 minutes for participants to complete. A "Submit" button at the end of the survey saved their responses, making them available for researchers to review.

F. DATA ANALYSIS

The output of data and charts provided by SurveyMonkey were used for the initial review of data to determine overall response rates and trends in the data. Responses to the frontline supervisor survey were imported from SurveyMonkey into Excel to calculate descriptive statistics as well as statistical significance and confidence intervals (CIs). The statistical package R was used for the analysis of interrater reliability (IRR).

The first step of the analysis was to assess the consistency of frontline supervisor agreement for each given competency's domain applicability: HSI, SE, PM, S&T, or Other and the work-level assignment, one through four (entry level through expert). This was performed using binomial hypothesis testing on the probability that greater than 50%

of the respondents agree on the domain or work level placement: probability $p > 0.5$ with criteria $\alpha \leq 0.10$. Simultaneous confidence intervals for multinomial proportions were calculated to 95% for each domain or work level within each meta-competency.

Next, the analysis reviews the consistency of frontline supervisor agreement on each meta-competencies' domain and work level assignment. Fleiss' Kappa was used to assess IRR for the assignment of meta-competencies to each of five domains as well as the four work levels. The domain and work-level analyses were performed separately. Fleiss' Kappa statistically measures the reliability of agreement for categorical items compared to random assignment in order to assess the degree of agreement greater than chance (Fleiss, 1971). Fleiss' Kappa offers a gauge on the reliability of the survey and CDM process.

After analyzing all levels of meta-competencies, the analysis focused on level 1. Entry-level KSA meta-competencies were evaluated for criticality and frequency, and then prioritized in ascending order of importance. Importance was defined as the highest value of the product of the criticality and frequency. Assignment of the current and preferred source for gaining level one KSAs were analyzed for agreement using the same criteria as for the domain and level assignment; probability $p > 0.5$ with criteria $\alpha \leq 0.10$. Ninety-five percent confidence intervals (CIs) were also calculated around the reported percentage for each source within the meta-competency. The crosswalk of KSAs to associated AEs is presented in a table to show general agreement, by way of percentage.

G. PROTECTION OF HUMAN SUBJECTS

Every effort has been taken to protect the human subjects involved in this research. Participants were identified by their respective command leadership as the target population and forwarded their names and email addresses to the researchers. Participants received a brief email from the researchers outlining the survey topics, anticipated time commitment, potential benefits of the research, and the voluntary nature of their participation. Upon selecting the participation link, they had to read the informed consent statement and agree to it before gaining access to the survey. This research was approved by the IRB, protocol number NPS.2012.0059-IR-EM2-A.

IV. RESULTS

A. OVERVIEW

The planned analysis consisted of two components: (1) using a CDM checklist to have SMEs validate and amend an HSI meta-competency list and (2) administering an FSS to have managers assess practitioner HSI meta-competencies in terms of acquisition career field association, appropriate development level, and relative importance. Descriptive statistics formed the basis for analyzing SME CDM checklist responses and the results were then used to adjust the list of HSI meta-competencies. The adjusted list was the basis for developing the FSS, which was administered to frontline supervisors at the three major Navy SYSCOMs. The FSS response analyses provided a basis for aligning HSI meta-competencies with practitioner development levels, prioritizing their development within levels, and partitioning them in terms of acquisition field.

B. COMPETENCY DEVELOPMENT MODEL (CDM) CHECKLIST

Checklist responses were collected during the HSI curriculum review from 10 senior Navy, Army, Air Force, Coast Guard, and NASA SMEs, with an average of more than 13 years' experience in HSI or a related field. The criticality of a practitioner to possess each meta-competency was rated on a scale of 1 to 5, where 1 represented "not valuable" and 5 represented "critical," and then analyzed using mean, variance, and frequency of assignment to the various levels of criticality. Those statistics were used to identify the tendency of each meta-competency as being valid in order to keep them in the CDM. Statistical significance was not used; instead, each meta-competency was individually reviewed for the trend in responses. Table 5 summarizes the average criticality rating for each AE and KSA work levels, as well as the overall mean and range values. The mean criticality was 4.21, and average meta-competency values ranged from 3.22 to 4.89. Based on these results, all meta-competencies were deemed valid and remained in the CDM. Appendix B shows the summary statistics used to verify the meta-competencies as valid, to include in the CDM and the designated work level.

Mean Criticality by Selection				Overall Criticality	
Level 1 AE	3.98	Level 1 KSA	3.98	Overall Mean	4.21
Level 2 AE	4.33	Level 2 KSA	4.02	Max Value	4.89
Level 3 AE	4.23	Level 3 KSA	4.32	Min Value	3.22
Level 4 AE	4.34	Level 4 KSA	4.33		

Table 5. Average SME ratings for meta-competency criticality

Work-level selections were analyzed by the average work-level placement, as well as frequency count and percent assignment to each level. Across all eight sections—four levels of KSAs and four levels of AE—there was 95% agreement on work-level placement by the SMEs; all meta-competencies remained at their original work level. Table 6 provides a summary of average percent agreement for work-level placement, with the original work-level placement bolded. The SME work-level assignment was used in the design of the FSS to place the meta-competencies within a work level.

	Level 1	Level 2	Level 3	Level 4
Level 1 AE	**83.3%**	10.00%	6.70%	0.00%
Level 2 AE	4.00%	**94.00%**	2.00%	0.00%
Level 3 AE	0.00%	1.90%	**99.4%**	5.00%
Level 4 AE	1.30%	0.70%	2.00%	**96.00%**
Level 1 KSA	**98.00%**	2.00%	0.00%	0.00%
Level 2 KSA	0.00%	**98.90%**	1.10%	0.00%
Level 3 KSA	0.00%	2.00%	**97.00%**	1.00%
Level 4 KSA	0.00%	5.00%	0.00%	**95.00%**

Table 6. Percent agreement on work-level placement by section

C. FRONTLINE SUPERVISOR SURVEY (FSS)

Frontline supervisors from NAVAIR, NAVSEA, and SPAWAR, and their respective warfare centers and laboratories, were solicited to participate in our survey with organizational approval. A total of 24 SYSCOM frontline supervisors participated out of the 46 who were invited, yielding a 52.2% return rate. Frontline supervisor DoD acquisition experience ranged from less than 5 years to more than 30 years, with 58% having over five years of experience. Figure 10 indicates the percentage of respondents in each year group range.

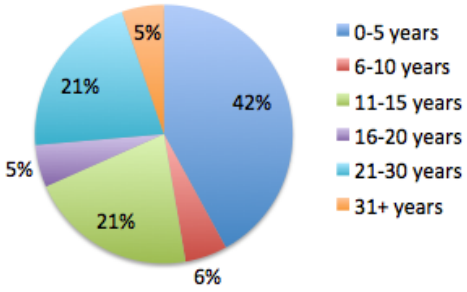


Figure 10. Respondent's years of acquisition experience

Of the years respondents have spent working with acquisition, their time working with HSI is divided as shown in Figure 11.

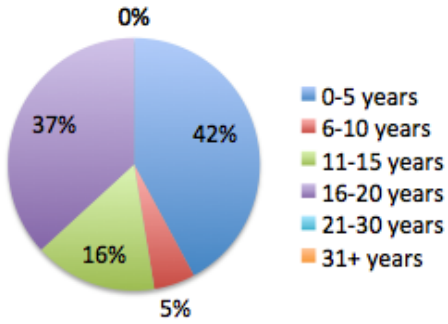


Figure 11. Respondent's years of HSI-related experience

One hundred percent of the participants identified their DAWIA certification field as SE – SPRDE, and 73.3% were certified as DAWIA Level III.

1. Acquisition Domain and Work-Level Assignment

With criticality and work-level assignment established for each meta-competency by the SMEs, the FSS sought to identify more specific traits of each meta-competency. For each meta-competency, the FSS focused on acquisition domain affiliation and work-level placement. Furthermore, it asked frontline supervisors to identify the importance and sourcing of level 1 KSAs to aid in the development of an entry-level IDP. Analysis aligned each meta-competency to an acquisition domain (HSI, SE, PM, S&T, Other) and competency work level (1, 2, 3, 4). Alignment was determined using a binomial hypothesis test on probability $p > 0.5$ with criteria $\alpha \leq 0.10$. A less restrictive

significance criterion was used due to the exploratory nature of this research; it being more appropriate to err on the side of including, rather than excluding, meta-competencies than if it was a confirmatory study.

Using Goodman's equation for simultaneous confidence intervals (CI) for multinomial proportions, 95% CIs were produced around the response percentage using the equation:

$$\pi_i = \frac{\chi^2 + 2n_i \pm \sqrt{\chi^2\left[\chi^2 + 4n_i\left(N - n_i\right)/N\right]}}{2\left(N + \chi^2\right)},$$

where $\chi^2 = \chi^2\left(\frac{\alpha}{k}, 1\right)$ (Goodman, 1965).

For both acquisition domain and work level, statistical significance indicates that greater than 50% of the respondents agreed on the domain or level assignment for a given meta-competency. A total of 38 meta-competencies were significant; 33 for the acquisition domain of HSI, 4 for SE, and 1 meta-competency was significant for PM at the $\alpha \leq 0.10$ level. Figure 12 presents a selection of the domain-significant meta-competencies; specifically, the significant meta-competencies from AE levels 1 and 2.

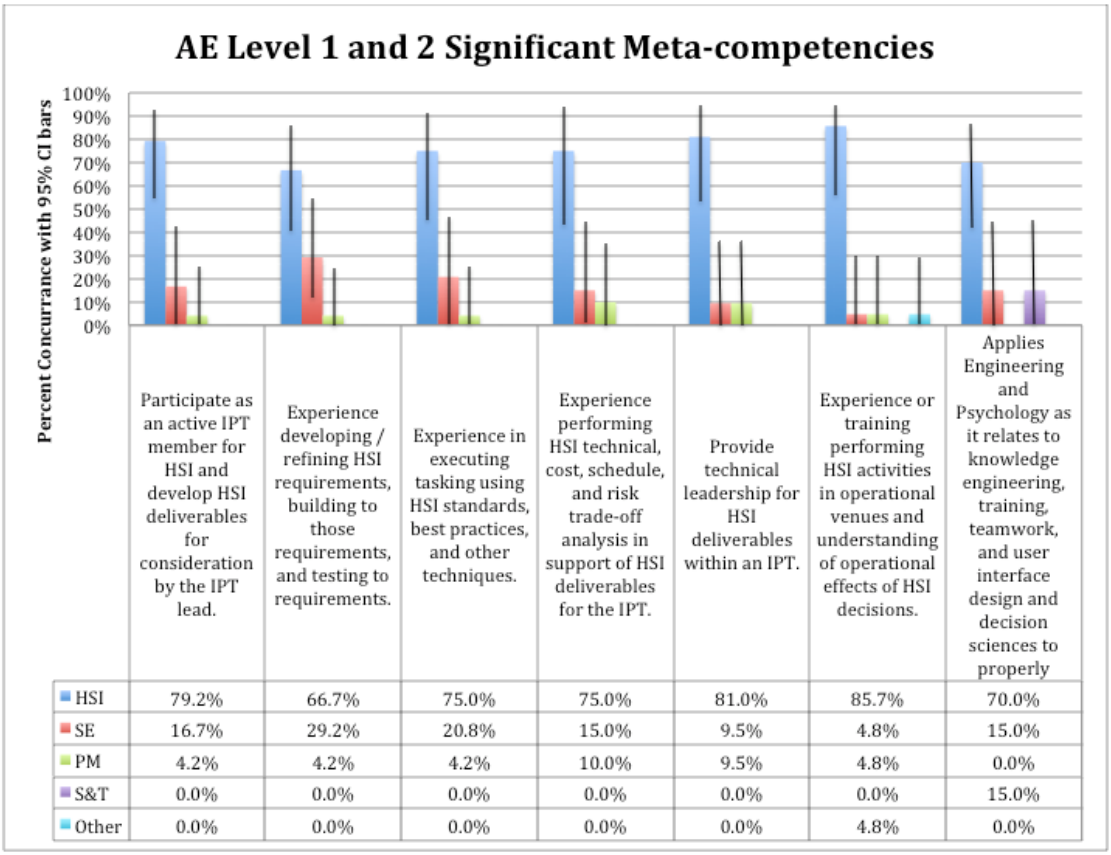


Figure 12. AE Levels 1 and 2 significant meta-competencies for domain assignment

Table 7 shows the list of significant AE meta-competencies and Table 8 shows the significant KSA meta-competencies. Appendix C is a table of all acquisition domain meta-competencies with the percent agreement for each domain as well as the 95% CI values. In Appendix C, significant meta-competencies are indicated by bold type.

AE Level 1
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.
Experience in executing tasking using HSI standards, best practices, and other techniques.
AE Level 2
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.
Provide technical leadership for HSI deliverables within an IPT.
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.
Applies Engineering and Psychology as it relates to knowledge engineering, training, teamwork, and user interface design and decision sciences to properly influence relevant documentation.
AE Level 3
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.
Serve as a HSI technical consultant and advisor for a particular technology area.
Experience providing HSI technology projections for a particular area.
Performance of technical mentoring for other HSI Competency assigned personnel.
Serve as the lead of an HSI team/project for 1 year.
Designation as an HSI Technical Warrant Holder (desired).
Aligns HSI efforts to support objectives on behalf of the war fighter.
Works to improve the DAWIA/SPRDE-SE process regarding HSI practices.
Demonstrates authoritative execution, revision, and implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.
Demonstrates Advanced Level Learning/On the job experience. (e.g. Revising existing and developing new HSI policy, consultation/mentorship, training the workforce, developing improved HSI products and tools, managing Entry and Intermediate level HSI staffs.)
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, writing papers, discussion panels; influencing leadership at highest levels of management.
AE Level 4
Forecast competency demand signals for HSI.
Develop and implement strategic vision for HSI.
Developing KSA and assignment/experience requirements for HSI.
Author peer-reviewed journal articles on HSI.
Assigned as a Technical Area Expert in HSI.
HSI competency lead.
Nationally recognized leader in HSI.
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.
Answers HSI needs and objectives of the user community.
Approval authority for meeting DAWIA requirements within the HSI competency.
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.

Table 7. Significant AE meta-competencies for domain assignment

KSA Level 1
A beginning knowledge of purpose and process of technical analyses.
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.
KSA Level 2
HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)
Systems Engineering Certificate (desired). (NPS four course certificate program)
In-depth knowledge of job related HSI domain levels.
Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.
Knowledge of human performance measurement and ability to measure it.
Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).

Table 8. Significant KSA meta-competencies for domain assignment

There were 23 significant work-level meta-competencies at the $\alpha \leq 0.10$ level; all were significant at the originally assigned work level. Figure 13 presents a selection of the significant work-level meta-competencies; specifically, the significant work levels from AE levels 1 through 4.

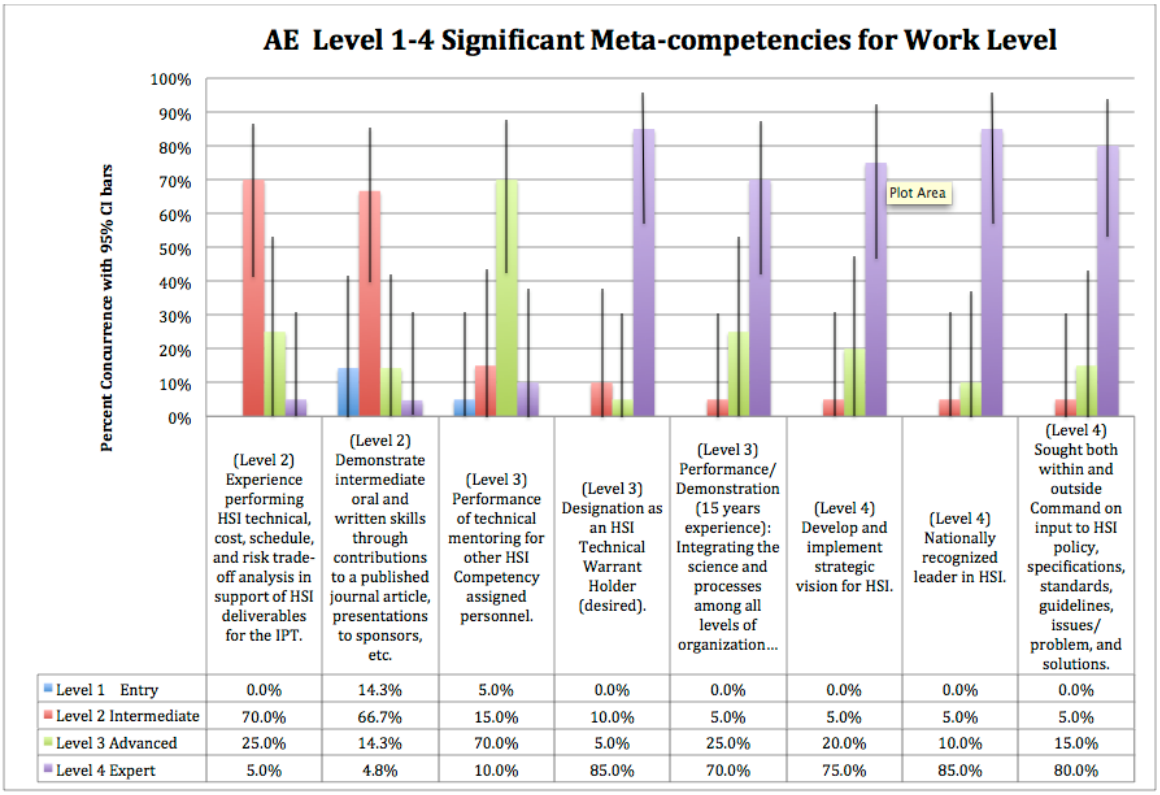


Figure 13. AE Levels 1-4 significant meta-competencies for work-level assignment

Table 9 lists all the AE meta-competencies that were significantly assigned to a work level and Table 10 lists the KSA meta-competencies significantly assigned to a work level. Appendix D is a table of all meta-competencies, with percent agreement on work level as well as the 95% CI values. In Appendix D, significant meta-competencies are indicated by bold type.

AE Level 2
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.
AE Level 3
Performance of technical mentoring for other HSI Competency assigned personnel.
Designation as an HSI Technical Warrant Holder (desired).
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, writing papers, discussion panels; influencing leadership at highest levels of management.
AE Level 4
Develop and implement strategic vision for HSI.
Nationally recognized leader in HSI.
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.

Table 9. Significant AE meta-competencies for work-level assignment

KSA Level 1
Undergraduate degree in Engineering or HSI-related area.
Knowledge of the acquisition process/policy.
A beginning knowledge of purpose and process of technical analyses.
Basic familiarity with organizational structure and current status of the user community that they are currently assigned to support.
Completion of DAU Acquisition 101 (web based) for all competency personnel.
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, teamwork, user interface design and decision sciences.
KSA Level 2
HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)
Systems Engineering Certificate (desired). (NPS four course certificate program)
Knowledge of human performance measurement and ability to measure it.
Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).
KSA Level 3
Leadership development (alliance development for influence in HSI community).
Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.
Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.
Familiar with challenges, needs and objectives facing the user community that they serve to include arrangement and order of commands to which they are subordinate.

Table 10. Significant KSA meta-competencies for work-level assignment

D. INTERRATER RELIABILITY

Fleiss' Kappa was used to identify the degree of agreement on meta-competency assignment to acquisition domain and work level that is greater than what is expected, based on chance. Thus, Fleiss' Kappa gives the chance-adjusted measure of agreement between the frontline supervisors for their domain and work-level classification. For Fleiss' Kappa, $K = 1$ indicates all raters are in complete agreement and $K \leq 0$ indicates no agreement greater than what would be expected by chance. The results for the domain and work-level Fleiss' Kappa analysis are shown in Table 11. The null hypothesis for Fleiss' Kappa is that any agreement among the raters is due strictly to chance; $H_o : K \leq 0$ and $H_a : K > 0$. Since the p-vales are less than 0.05, agreement on both domain and work-level assignment is due to more than chance. The Kappa values for both the domain and work level indicate fair agreement.

Fleiss' Kappa: Acquisition Domain		Fleiss' Kappa: Work Level	
Meta-competencies	77	Meta-competencies	77
Raters	17	Raters	18
Kappa	0.303	Kappa	0.281
Z	50.1	Z	50.8
p-value	0	p-value	0

Table 11. Fleiss' Kappa for domain and work-level assignment

E. LEVEL 1 KSA IMPORTANCE RANKING

After reviewing all 77 meta-competencies for their acquisition domain alliance and work-level placement, the research focused more on the level 1 KSAs. This second effort strove to order the validated level 1 KSAs by importance, which was defined through criticality and frequency of use for an entry-level HSI practitioner. Frontline supervisors rated both criticality and frequency on a scale from 1 to 5, with 5 being the high value for each scale. The two scores for criticality and frequency were then multiplied together to get the value for importance. By multiplying the 1 to 5 values for criticality and frequency, the resulting scale for importance ranged from 1 to 25, where 1 indicates least important and 25 indicates most important. Each of the 18 respondents' assignment of criticality and frequency were individually multiplied to produce 18 values of importance for each meta-competency. The 18 values were averaged and then rank ordered to produce Table 12.

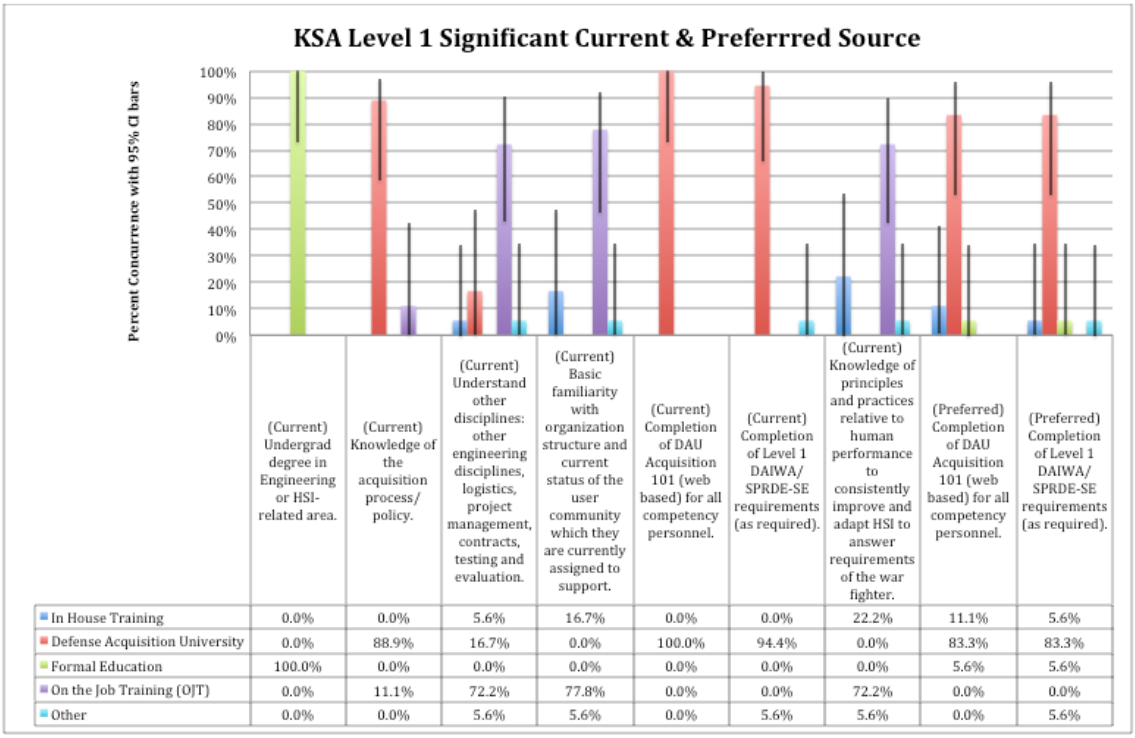
Level 1 KSAs Ranked by Calculated Importance	Average Importance
Undergraduate degree in Engineering or HSI-related area.	20.83
Knowledge of the acquisition process/policy.	19.72
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	16.78
A beginning knowledge of purpose and process of technical analyses.	16.72
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	16.00
Basic familiarity with organizational structure and current status of the user community that they are currently assigned to support.	15.94
Completion of DAU Acquisition 101 (web-based) for all competency personnel.	15.72
Completion of Level I DAIWA/SPRDE-SE requirements (as required).	15.50
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, teamwork, user interface design and decision sciences.	13.78
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	13.39

Table 12. Level 1 KSAs ranked by importance

F. LEVEL 1 KSA CURRENT AND PREFERRED SOURCING

Questions pertaining to the current and preferred source for gaining level 1 KSA meta-competencies were analyzed using the same method as the domain and work-level assignments. Ninety-five percent CIs bound the percentage agreement for each source of the gaining the competency were calculated using Goodman's equation (as presented earlier). Each meta-competency was reviewed for statistical significance; again, determined in the same manner as before with a binomial hypothesis test on probability $p > 0.5$ with criteria $\alpha \leq 0.10$. Statistical significance indicates that greater than 50% of respondents selected the same source of gaining the meta-competency. Seven of the 10 meta-competencies are statistically significant when identifying the current source of gaining the KSA. For the preferred source of the KSA, only two of the

meta-competencies are statistically significant. Figure 14 shows both the current and preferred source of gaining each KSA for the statistically significant meta-competencies.



	(Current) Undergrad degree in Engineering or HSI-related area.	(Current) Knowledge of the acquisition process/ policy.	(Current) Understand other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	(Current) Basic familiarity with organization structure and current status of the user community which they are currently assigned to support.	(Current) Completion of DAU Acquisition 101 (web based) for all competency personnel.	(Current) Completion of Level 1 DAIWA/ SPRDE-SE requirements (as required).	(Current) Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	(Preferred) Completion of DAU Acquisition 101 (web based) for all competency personnel.	(Preferred) Completion of Level 1 DAIWA/ SPRDE-SE requirements (as required).
In House Training	0.0%	0.0%	5.6%	16.7%	0.0%	0.0%	22.2%	11.1%	5.6%
Defense Acquisition University	0.0%	88.9%	16.7%	0.0%	100.0%	94.4%	0.0%	83.3%	83.3%
Formal Education	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.6%	5.6%
On the Job Training (OJT)	0.0%	11.1%	72.2%	77.8%	0.0%	0.0%	72.2%	0.0%	0.0%
Other	0.0%	0.0%	5.6%	5.6%	0.0%	5.6%	5.6%	0.0%	5.6%

Figure 14. KSA Level 1 significant meta-competencies for identification of current and preferred source

G. CROSSWALK OF LEVEL 1 KSA AND AE

Focusing on the level 1 AEs and KSAs, survey participants were asked to identify any and all AEs that fulfill each KSA. The percentages in each cell represent the percentage of participants who cited the column's AE as fulfilling the KSA for that row. Since more than one selection was possible per row and column the values do not add to 100%. One AE was omitted from this crosswalk: the performance/demonstration (three years' experience) that serves as summary exit criteria for the Level 1 AEs and does not apply directly to the KSAs. The summary results are presented in Table 13.

Level 1 KSAs	Level 1 Assignments and experiences that fulfill the level 1 KSAs				
	Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	Experience in executing tasking using HSI standards, best practices, and other techniques.	Experience with cost control, configuration management, design reviews, and life-cycle perspectives.
Undergraduate degree in Engineering or HSI-related area.	55.6%	50.0%	22.2%	50.0%	16.7%
Knowledge of the acquisition process/policy.	61.1%	66.7%	88.9%	33.3%	77.8%
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	83.3%	83.3%	66.7%	83.3%	61.1%
A beginning knowledge of purpose and process of technical analyses.	66.7%	66.7%	27.8%	55.6%	50.0%
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	88.9%	50.0%	77.8%	44.4%	77.8%
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.	77.8%	27.8%	38.9%	16.7%	38.9%
Completion of DAU Acquisition 101 (web based) for all competency personnel.	27.8%	33.3%	61.1%	22.2%	61.1%
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).	44.4%	50.0%	61.1%	16.7%	66.7%
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.	66.7%	66.7%	27.8%	72.2%	22.2%
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	72.2%	83.3%	44.4%	77.8%	55.6%

Table 13. Crosswalk for level 1 AEs that fulfill level 1 KSAs

H. SUMMARY

All responses to the survey were maintained for the analysis; none were removed. The 95% CI provides a statistically-recognized boundary for a reasonable range of responses. Although most of the meta-competencies identified as significant at the $\alpha \leq 0.10$ level were also significant at the $\alpha \leq 0.05$ level, using $\alpha \leq 0.10$ decreases the chance of omitting a valuable meta-competency and helps adjust for the small sample size. Fleiss' Kappa compared the responses of participants who responded to all the acquisition domain placement and work-level placement questions, which were 17 and 18, respectively. Level 1 KSAs were reviewed for their importance, sourcing, and relation to the Level 1 AEs. The analysis allowed for conclusions to be drawn on the CDM and the development process for the CDM, as well as the creation of an entry-level HSI practitioner IDP.

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V. DISCUSSION

A. OVERVIEW

This research was conducted to produce a general model for constructing CDMs, as well as a validated HSI CDM with specific focus on developing entry-level HSI practitioners. The method outlined in this research included the initial development of a notional CDM by HSI SMEs at SPAWAR, review of the meta-competencies by a broader audience of SMEs to validate the list, and, finally, a review by frontline supervisors to identify the predominate domain for each meta-competency and confirm their work-level placement. The developed CDM assists with career management through all work levels and the entry-level IDP lays specific groundwork for any employee new to the DAW and HSI competency. The questions answered through this research pertain to the alignment of identified meta-competencies to the appropriate work level. This research also provides an entry-level IDP with statistically validated KSAs and AEs rank ordered by importance and their source.

B. RESEARCH QUESTIONS

1. Required Meta-Competencies for the CDM and HSI Practitioners

Tests of statistical significance were used to answer the research question: what meta-competencies are required for an HSI practitioner in the DAW? Analysis of the SME checklist confirmed that the previously identified meta-competencies were valid and important to an HSI practitioner. Therefore, they were included in the FSS. Frontline supervisor alignment of each meta-competency to a domain organized the meta-competencies into applicable categories, which can be used by the DAW and SYSCOMs to identify training responsibility and sourcing. Failure for a meta-competency to be statistically significant within a domain is not cause for removal from the CDM. Instead, it leaves room for further analysis of the sourcing for training, education, and department oversight, which may or may not be from a single domain.

Identifying a domain categorization as statistically significant indicates greater than 50% of respondents placed it in that domain. Based on that, we conclude it has been

correctly assigned. For the 33 HSI meta-competencies identified as statistically significant, this research suggests the SYSCOM HSI competency managers oversee the training and education related to acquiring those meta-competencies. Similarly, training and education responsibility for the significant SE and PM domains would be the responsibility of those domain leaders. The acquisition of AEs by a practitioner also needs to be tracked to ensure that each employee career path is designed for them to achieve the AEs and progress to the next work level. Employee IDPs provide the appropriate vehicle between managers and employees to outline the necessary career AEs, required training, and education in pursuit of attaining the identified KSAs.

2. Work-Level Placement for Meta-Competencies

Work-level placement for each meta-competency was verified twice—once by the CDM checklist and again in the FSS. The SME responses established the original work-level placements. Therefore, no changes to work level were made in developing the FSS. Similar to identifying statistical significant acquisition domains, correct work-level placements were determined by greater than 50% concurrence on work-level placement. Of the 77 meta-competencies, 23 were significant in their work-level assignment by the frontline supervisors. All of the significant work levels were within the originally assigned level; none indicated the need to move it a different one. Identifying the appropriate work level ensures that the meta-competencies are ordered and timed correctly in an HSI practitioner's career to continually improve and train to the next level. Overall, it supports successful career management.

C. ENTRY-LEVEL PRACTITIONER DEVELOPMENT

This research looked further into the Level 1 meta-competencies and their relation to the development of entry-level HSI practitioners. In order to combat the impending decrease in the DAW and HSI practitioners, the rapid development of entry-level practitioners is critical to setting them up for the rest of their career and properly arming them with the necessary base of career skills. With each meta-competency already verified as important by HSI SMEs, the participating frontline supervisors' survey sought to rank order the level 1 KSAs by a calculated level of importance. Participants were

asked to evaluate level 1 KSAs for criticality and importance. Both were rated on a scale of 1 to 5, where 5 was the high value. Importance was determined by the product of the two ratings and then averaged among all the raters, resulting in a scale from 1 to 25, where 25 represented the highest level of importance and 1 the lowest. The highest level of importance was 20.83 and pertained to "knowing the acquisition process/policy." The lowest level of importance was 13.39, which was the completion of DAU Acquisition 101 course. In an industry of limited time and resources, rank ordering is valuable to identify where to direct funding and which KSAs need to be developed early in an HSI practitioner's career. It is crucial to rank order the KSAs in an employee's IDP to ensure that both the supervisor and employee understand the importance of each.

Beyond the importance of each meta-competency, this research identified both the current and preferred sourcing of each KSA. The analysis for identifying the correct source followed the same statistical significance test as the domain and work-level identification. Significant agreement beyond 50% indicated the correct source assignment. The current source for 7 of the 10 entry-level KSAs were statistically significant, while only two of the preferred sources were statistically agreed on. The two significant sources both pertained to DAWIA/DAU courses and identified DAU as the preferred source; those two KSAs had 100% agreement on DAU as the current source. The greater number of agreement for the current source indicates that across the SYSCOMs there is agreement on how KSAs are currently gained. By previously identifying the KSA sourcing, it relieves the supervisor and employee of that burden, while building the employee's IDP.

D. IDP DEVELOPMENT

Leveraging the assessments on Level 1 meta-competencies, an entry level IDP was developed and input into the OPM IDP form. The KSAs were ranked by importance and paired with the developmental activities; AEs and DAWIA SE-SPRDE Level I requirements needed to achieve the KSA. Although each AE may be associated with multiple KSAs, an AE was assigned to the KSA with the highest level of importance. Since employees should focus on gaining the KSAs in order of importance, assigning an

AE only to the highest KSA will ensure that the most prolific AEs, and DAWIA requirements, are accomplished first. The current sourcing for each KSA was identified as well. Space is provided in association with each KSA for classification of importance, tracking of completion dates, cost, and supervisory approval. The entry-level IDP is in Appendix E.

Providing an entry-level IDP preset with the critical KSAs ensures that all frontline supervisors and new HSI practitioners know the requirements for successful development and career management. It further enables the employees to set valuable goals and provides the avenue by which to achieve those goals. From the supervisor's perspective, it ensures employee time is spent developing validated KSAs in the order of importance to their job. Furthermore, it offers a valid platform for performance appraisals and tracks employee advancement to the next work level for possible promotion considerations. Pursuit of the identified KSAs remains the responsibility of the employee, with the support of their supervisor, but awareness and consistency across the SYSCOMs is an asset to the employee, SYSCOM, and especially the future of the HSI competency.

E. CONCLUSIONS

This research validated a notional HSI CDM and developed an entry-level HSI IDP. It indicates the critical meta-competencies for an HSI practitioner to achieve in order to be successful in the Navy SYSCOMs. Specifically, it focused on the entry level, which is critical to development later in a career. Including validated meta-competencies in the career management of DAW HSI employees increases the quality of those employees, the work completed, and the overall products. This research is invaluable to the advancement of the HSI competency, especially at a time when the SYSCOMs and HSI competency are looking to increase the number of their personnel to help meet customer demands. The development of each employee is critical to the future of the SYSCOMs. This research outlines a path to success for the HSI competency as well as a roadmap for other competencies to follow, in order to recover from manpower shortages and succeed.

F. FURTHER RECOMMENDATIONS

Further recommendations for research include the development of HSI IDPs for levels 2–4. This research also serves as a model for other competencies to validate CDMs and create valuable IDPs. Further research could duplicate the validation process of a notional CDM to a CDM capable of building employee IDPs.

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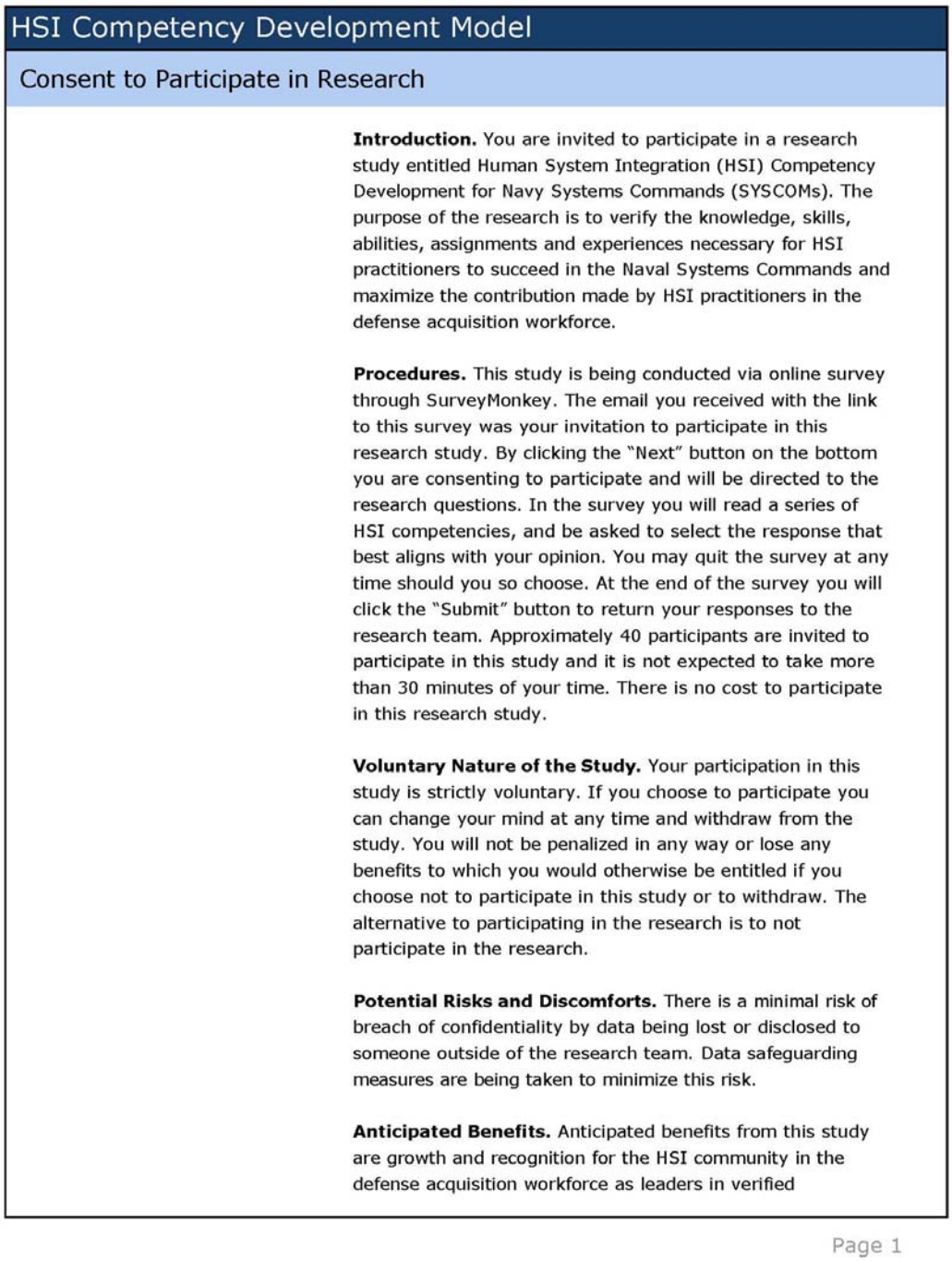
APPENDIX A. ONLINE FRONTLINE SUPERVISOR SURVEY



HSI Competency Development Model

Consent to Participate in Research

Introduction. You are invited to participate in a research study entitled Human System Integration (HSI) Competency Development for Navy Systems Commands (SYSCOMs). The purpose of the research is to verify the knowledge, skills, abilities, assignments and experiences necessary for HSI practitioners to succeed in the Naval Systems Commands and maximize the contribution made by HSI practitioners in the defense acquisition workforce.

Procedures. This study is being conducted via online survey through SurveyMonkey. The email you received with the link to this survey was your invitation to participate in this research study. By clicking the "Next" button on the bottom you are consenting to participate and will be directed to the research questions. In the survey you will read a series of HSI competencies, and be asked to select the response that best aligns with your opinion. You may quit the survey at any time should you so choose. At the end of the survey you will click the "Submit" button to return your responses to the research team. Approximately 40 participants are invited to participate in this study and it is not expected to take more than 30 minutes of your time. There is no cost to participate in this research study.

Voluntary Nature of the Study. Your participation in this study is strictly voluntary. If you choose to participate you can change your mind at any time and withdraw from the study. You will not be penalized in any way or lose any benefits to which you would otherwise be entitled if you choose not to participate in this study or to withdraw. The alternative to participating in the research is to not participate in the research.

Potential Risks and Discomforts. There is a minimal risk of breach of confidentiality by data being lost or disclosed to someone outside of the research team. Data safeguarding measures are being taken to minimize this risk.

Anticipated Benefits. Anticipated benefits from this study are growth and recognition for the HSI community in the defense acquisition workforce as leaders in verified

Page 1

competency development. This will improve competency management and ensure continued high-level procurement of goods for the Navy. There is no direct benefit to you for participating.

No tangible compensation will be provided to participants.

Confidentiality & Privacy Act. Any information that is obtained during this study will be kept confidential to the full extent permitted by law. All efforts, within reason, will be made to keep your personal information in your research record confidential but total confidentiality cannot be guaranteed. Data will be stored in a password protected file on the Naval Postgraduate School secure server and any hard copies of data will be stored in a locked location. Raw data will only be accessible to members of the research team.

Points of Contact. If you have any questions or comments about the research, or you experience an injury or have questions about any discomforts that you experience while taking part in this study please contact the Principal Investigator, CAPT John K. Schmidt, USN, 831-656-3864, jkschmidt@nps.edu. Questions about your rights as a research subject or any other concerns may be addressed to the Naval Postgraduate School IRB Vice Chair, Dr. Maiah Jaskoski, 831-656-3167, majaskos@nps.edu.

Statement of Consent. "I have read the information and agree to participate."

HSI Competency Development Model

Your participation in this survey as a supervisor of HSI within a Navy SYSCOM is appreciated and your responses are highly valued.

In this study you will be asked to read competencies for either knowledge, skills, and abilities or assignments and experiences. Each grouping is aligned within one of the four work levels: Entry, Intermediate, Advanced or Expert. Descriptions of the work levels will be provided with each question for easy reference. Each of these competencies have been indicated by HSI subject matter experts as valuable to an HSI practitioner within each of the assigned levels.

HSI Competency Development Model

Competency alignment and level classification

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Assignments/Experiences

Entry level (1)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.		
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.		
Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.		
Experience in executing tasking using HSI standards, best practices, and other techniques.		
Experience with cost control, configuration management, design reviews, and life-cycle perspectives.		
Performance/Demonstration (3 years experience): Participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing systems engineering procurement package development, evaluating and reporting on Contract Data Requirements List (CDRL) input from contractors. Skilled in analysis techniques, including Gap, Trade-Off, and Trade Space Analyses. Ability to conduct studies and analyze results.		

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

Assignments and Experiences, Intermediate Level (2)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Assignments/Experiences

Intermediate level (2)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.		
Participate in a cross-domain IPT.		
Provide technical leadership for HSI deliverables within an IPT.		
Increase exposure to other competencies. Providing support to a non-HSI competency effort to produce an IPT deliverable.		
Perform interface with the fleet customer or sponsor on technical issues.		
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.		
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.		
Applies Engineering and Psychology as it relates to knowledge engineering, training, teamwork, and user interface design and decision sciences to properly influence relevant documentation.		
Intermediate Level Learning/OJT (e.g. Mature level of hands-on participating, mentoring Entry Level, and further developing KSAs in Systems Engineering, Logistics, Project Management, Acquisition, and Supply Support.)		

HSI Competency Development Model

Performance/Demonstration (10 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing SE procurement package development, evaluating and reporting on CDRL input from contractors.

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

Assignments and Experiences, Advanced Level (3)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Assignments/Experiences

Advanced level (3)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.		
Serve as a HSI technical consultant and advisor for a particular technology area.		
Experience providing HSI technology projections for a particular area.		
Experience with technology transition.		
Experience dealing directly with the customer or end-user.		
Performance of technical mentoring for other HSI Competency assigned personnel.		
Leadership of a Community of Interest or Mission Area Team (desired).		
Participation on a cross-SYSCOM or organizational IPT or significant exposure working with other organizations to address technical challenges (desired).		
Demonstrate advanced oral and written skills by authoring/co-authoring peer-reviewed journal articles, briefings to senior executives, etc.		
Serve as the lead of an HSI team/project for 1 year.		
Participate on a source selection panel for a competitive contract (desired).		
Designation as an HSI Technical Warrant Holder (desired).		
Aligns HSI efforts to support objectives on behalf of the war		

HSI Competency Development Model

fighter.		
Works to improve the DAWIA/SPRDE-SE process regarding HSI practices.		
Demonstrates authoritative execution, revision, and implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.		
Demonstrates Advanced Level Learning/On the job experience. (e.g. Revising existing and developing new HSI policy, consultation/mentorship, training the workforce, developing improved HSI products and tools, managing Entry and Intermediate level HSI staffs.)		
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, writing papers, discussion panels; influencing leadership at highest levels of management.		

HSI Competency Development Model

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

Assignments and Experiences, Expert Level (4)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Assignments/Experiences

Expert level (4)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Create technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.		
Forecast competency demand signals for HSI.		
Develop and implement strategic vision for HSI.		
Developing KSA and assignment/experience requirements for HSI.		
Author peer-reviewed journal articles on HSI.		
Assigned as a Technical Area Expert in HSI.		
HSI competency lead.		
Nationally recognized leader in HSI.		
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.		
Serves as Division Head or Senior Technical Staff responsible for HSI personnel.		
Answers HSI needs and objectives of the user community.		
Approval authority for meeting DAWIA requirements within the HSI competency.		
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.		

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

KSA Entry Level (1)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Knowledge Skills and Abilities

Entry level (1)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Undergraduate degree in Engineering or HSI-related area.		
Knowledge of the acquisition process/policy.		
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.		
A beginning knowledge of purpose and process of technical analyses.		
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.		
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.		
Completion of DAU Acquisition 101 (web based) for all competency personnel.		
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).		
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.		
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.		

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

KSA Intermediate Level (2)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Knowledge Skills and Abilities

Intermediate level (2)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)		
Systems Engineering Certificate (desired). (NPS four course certificate program)		
In-depth knowledge of job related HSI domain levels.		
Understanding of HSI domain relationships with acquisition and the systems engineering processes.		
Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.		
Knowledge of human performance measurement and ability to measure it.		
Familiar with organizational structure and current status of the user community which they are currently assigned to support.		
Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).		

HSI Competency Development Model

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

KSA Advanced Level (3)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Knowledge Skills and Abilities

Advanced level (3)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Completion of an advanced technical degree, MS-SE, MS-HSI, or related advanced degree (desired).		
In-depth and working level knowledge of SE, HSI, and program/project management		
Leadership development (alliance development for influence in HSI community).		
Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.		
Completion of project management training and/or industry certification, such as project management professional (desired).		
Detailed knowledge of Acquisition Process, including Systems Engineering, Logistics, PPBE, and JCIDS.		
Knowledge of law and Government, relating to acquisition and human capital management.		
Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.		
Ability to manage resources, assess and manage HSI impacts and risks, and evaluate and provide HSI inputs to contract clauses, deliverables, and budgets.		
Familiar with challenges, needs and objectives facing the		

user community which they serve to include arrangement and order of commands to which they are subordinate.

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

KSA Expert Level (4)

Please read each of the competencies listed below and select which domain - Human Systems Integration (HSI), Systems Engineering (SE), Program Management (PM), Science & Technology (S&T) or Other - each competency is most closely aligned with as well as the work level the competency should occur at.

Knowledge Skills and Abilities

Expert level (4)

	What domain is this competency most closely aligned with? (HSI, SE, PM, S&T, Other)	Appropriate work level (1,2,3,4)
Completed Executive Management Training (desired).		
Post MS courses in SE and HSI (desired).		
Participates in continued technical education.		

Description of work levels provided for reference

For the first three levels, Entry, Intermediate and Advanced the criteria are considered exit criteria to be completed prior to advancement. For the Expert Level the criteria are considered to be a continuing requirement.

- **Level 1- Entry:** The most basic developmental level, generally applies to individuals who are new to a competency are and are capable of performing well with supervision. Generally efforts of this stage involve applying basic concepts and principles with significant support from others.

- **Level 2 - Intermediate:** This level represents individuals who have gained capability within a competency area. They generally begin to operate independently for a wide range of efforts, and may begin taking on responsibility for delivery within the IPT structure or for leading IPT efforts.

- **Level 3 - Advanced:** This stage represents those individuals who are capable of leading and mentoring multiple teams and/or large groups

- **Level 4 - Expert:** This is the highest level of development within the CDM. At this stage, individuals are sought out for consultation and assistance in their particular area of expertise. They generally develop policy and strategy and interface with senior-level counterparts in other organizations. Note that the Expert stage of the Leadership Dimension may also be termed "Expert (Senior Leader)" conveying the scope of influence expected of someone at this stage

HSI Competency Development Model

Entry Level KSA Prioritization

Please read each of the level one competencies listed below and indicate the criticality and frequency of use. This will only be asked for level 1 competencies.

Criticality is rated on a scale of 1 – 5, with 1 indicating not critical and 5 indicating very critical

Frequency is rated on a scale of 1 – 5, with 1 indicating less than once a year and 5 being daily

	Criticality of KSA	Frequency of application
Undergraduate degree in Engineering or HSI-related area.		
Knowledge of the acquisition process/policy.		
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.		
A beginning knowledge of purpose and process of technical analyses.		
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.		
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.		
Completion of DAU Acquisition 101 (web based) for all competency personnel.		
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).		
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.		
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.		

HSI Competency Development Model

Level 1 KSA Source

From the drop down menus, Please select the current primary source for gaining each listed competency and the source you would prefer to gain the competency from. This will only be asked for level 1 competencies.

Knowledge Skill and Ability Source Identification

Entry level (1)

	Current source of gaining the competency	Your preferred source to gain the competency
Undergraduate degree in Engineering or HSI-related area.		
Knowledge of the acquisition process/policy.		
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.		
A beginning knowledge of purpose and process of technical analyses.		
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.		
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.		
Completion of DAU Acquisition 101 (web based) for all competency personnel.		
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).		
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.		
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.		

Page 22

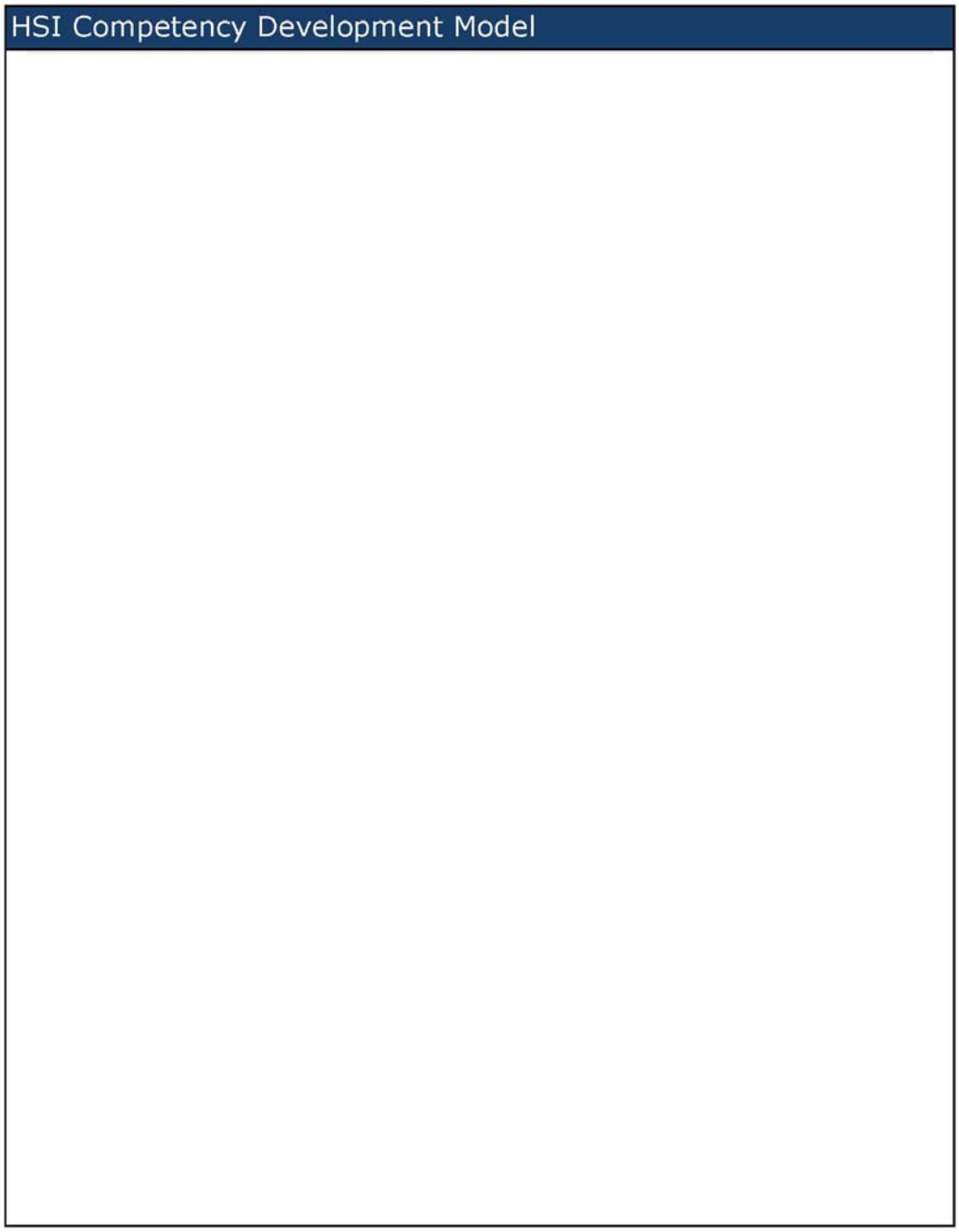
HSI Competency Development Model

Crosswalk of Level 1 KSAs to Level 1 AEs

For the following level one KSAs, identify any and all level one assignments and experiences that fulfill the KSA

	Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	Experience in executing tasking using HSI standards, best practices, and other techniques.	Experience with cost control, configuration management, design reviews, and life-cycle perspectives.
Undergraduate degree in Engineering or HSI-related area.	☐	☐	☐	☐	☐
Knowledge of the acquisition process/policy.	☐	☐	☐	☐	☐
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	☐	☐	☐	☐	☐
A beginning knowledge of purpose and process of technical analyses.	☐	☐	☐	☐	☐
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	☐	☐	☐	☐	☐

HSI Competency Development Model



Page 24

HSI Competency Development Model

Crosswalk of Level 1 KSAs to Level 1 AEs Continued

Continued from the previous page, for the following level one KSAs, identify any and all level one assignments and experiences that fulfill the KSA

	Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	Experience in executing tasking using HSI standards, best practices, and other techniques.	Experience with cost control, configuration management, design reviews, and life-cycle perspectives.
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.	☐	☐	☐	☐	☐
Completion of DAU Acquisition 101 (web based) for all competency personnel.	☐	☐	☐	☐	☐
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).	☐	☐	☐	☐	☐
Fundamental cognizance of Applied Engineering/Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.	☐	☐	☐	☐	☐
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to	☐	☐	☐	☐	☐

HSI Competency Development Model

answer requirements of
the war fighter.

HSI Competency Development Model

Demographic Information

What SYSCOM are you currently working for?

- ◯ NAVAIR
- ◯ NAVSEA
- ◯ SPAWAR

How many years of acquisition experience do you have? Please select the appropriate year range from those provided.

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21-30 years
- ◯ 31+ years

How many years have you worked with Human Systems Integration? Please select the appropriate year range from those provided.

- ◯ 0-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16-20 years
- ◯ 21-30 years
- ◯ 31+ years

What is your current DAWIA certification field and level?

	DAWIA Certification Field	DAWIA Certification Level
Please select your DAWIA certification field and level		

Page 27

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APPENDIX B. SME SUMMARY RESULTS RANK ORDERED BY IMPORTANCE

Assignments/Experience Entry Level (1)	Average Importance	Variance	SD	Importance Frequency Count 5	4	3	2	1	Assigned Level
Experience in executing tasking using HSI standards, best practices, and other techniques.	4.5	0.28	0.53	5	5	0	0	0	1
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	4.4	1.60	1.26	7	2	0	0	1	1
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	4.3	0.68	0.82	5	3	2	0	0	1
Performance/Demonstration (3 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing systems engineering procurement package development, evaluating and reporting on CDRL input from contractors. Skilled in analysis techniques, including Gap, Trade-Off, and Trade Space Analyses. Ability to conduct studies and analyze results.	3.9	2.10	1.45	5	2	1	1	1	1
Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	3.3	2.23	1.49	3	2	1	3	1	1
Experience with cost control, configuration management, design reviews, and life-cycle perspectives.	3.44	2.28	1.51	3	2	1	2	1	1

Assignments/Experience Intermediate Level (2)	Average Importance	Variance	SD	Importance Frequency					Assigned Level
				5	4	3	2	1	
Perform interface with the fleet customer or sponsor on technical issues.	4.7	0.23	0.48	7	3	0	0	0	2
Intermediate Level Learning/OJT: Mature level of Hands-On participating, mentoring Entry Level, further developing KSAs in Systems Engineering, Logistics, Project Management, Acquisition, and Supply Support.	4.56	0.28	0.53	5	4	0	0	0	2
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.	4.5	0.28	0.53	5	5	0	0	0	2
Participate in a cross-domain IPT.	4.5	0.50	0.71	6	3	1	0	0	2
Performance/Demonstration (10 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing SE procurement package development, evaluating and reporting on CDRL input from contractors.	4.4	0.49	0.70	5	4	1	0	0	2
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.	4.4	0.71	0.84	6	2	2	0	0	2
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.	4.3	0.46	0.67	4	5	1	0	0	2

Executes upon actionable knowledge of Applied Psychology and Engineering as it relates to knowledge engineering, training, team work, user interface design and decision sciences to properly influence relevant documentation.	4.1	0.99	0.99	4	4	1	1	0	2
Provide technical leadership for HSI deliverables within an IPT.	4	1.78	1.33	5	2	2	0	1	2
Increase exposure to other competencies. Providing support to a non HSI competency effort to produce an IPT deliverable.	3.9	1.43	1.20	3	5	1	0	1	2

Assignments/Experience Advanced Level (3)	**Average Importance**	**Variance**	**SD**	**Importance Frequency**					**Assigned Level**
				5	**4**	**3**	**2**	**1**	
Experience dealing directly with the customer or end-user.	4.8	0.18	0.42	8	2	0	0	0	3
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.	4.7	0.23	0.48	7	3	0	0	0	3
Performance of technical mentoring for other HSI Competency assigned personnel.	4.5	0.50	0.71	6	3	1	0	0	3
Experience with technology transition.	4.3	0.23	0.48	3	7	0	0	0	3
Serve as a HSI technical consultant and advisor for a particular technology area.	4.3	0.46	0.67	4	5	1	0	0	3
Demonstrates authoritative execution, revision, and implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.	4.3	0.46	0.67	4	5	1	0	0	3
Experience providing HSI technology projections for a particular area.	4.3	0.68	0.82	5	3	2	0	0	3

Participation on a cross-SYSCOM or organizational IPT or significant exposure working with other organizations to address technical challenges (desired).	4.2	0.40	0.63	3	6	1	0	0	3
Advanced Level Learning/OJT: Revising existing and developing new HSI policy, consultation/mentorship, training the workforce, developing improved HSI products and tools, managing Entry and Intermediate level HSI staffs.	4.2	0.40	0.63	3	6	1	0	0	3
Demonstrate advanced oral and written skills by authoring/co-authoring peer-reviewed journal articles, briefings to senior executives, etc.	4.2	1.73	1.32	6	2	1	0	1	3
Designation as an HSI Technical Warrant Holder (desired).	4.11	1.36	1.17	5	1	2	1	0	3
Performance/Demonstration (15 years experience): integrating the science and processes among all levels of organization; actively participating on Leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, writing papers, discussion panels; influencing leadership at highest levels of management.	4.1	0.54	0.74	3	5	2	0	0	3
Serve as a manager of HSI team/project for 1 year.	4	0.44	0.67	2	6	2	0	0	3
Participate on a source selection panel for a competitive contract (desired).	4	0.67	0.82	3	4	3	0	0	3

Projects HSI efforts to align to supporting objectives of Congress and the Combatant Commanders on behalf of the war fighter.	4	1.14	1.07	3	3	1	1	0	3
Leadership of a Community of Interest or Mission Area Team (desired).	3.9	1.43	1.20	3	5	1	0	1	3
Works to improve the DAWIA/SPRDE-SC process regarding HSI practices.	3.89	0.86	0.93	2	5	1	1	0	3
Assignments/Experience Expert Level (4)	**Average Importance**	**Variance**	**SD**	**Importance Frequency 5**	**4**	**3**	**2**	**1**	**Assigned Level**
Assigned as a Technical Area Expert in HSI.	4.7	0.23	0.48	7	3	0	0	0	4
HSI competency lead.	4.7	0.23	0.48	7	3	0	0	0	4
Sought out both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.	4.7	0.23	0.48	7	3	0	0	0	4
Develop and implement strategic vision for HSI.	4.6	0.27	0.52	6	4	0	0	0	4
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.	4.57	0.29	0.53	4	3	0	0	0	4
Authority within the DAWIA/SPRDE-SC process regarding HSI practices.	4.5	0.50	0.71	6	3	1	0	0	4
Create technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.	4.4	0.49	0.70	5	4	1	0	0	4
Answers HSI needs and objectives of the user community.	4.4	0.93	0.97	6	3	0	1	0	4

Create innovative HSI technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.	4.3	1.12	1.06	6	2	1	1	0	4
Nationally recognized leader in HSI.	4.2	0.40	0.63	3	6	1	0	0	4
Projects HSI efforts required to support objectives of Congress and the Combatant Commanders on behalf of the war fighter.	4.11	1.11	1.05	4	3	1	1	0	4
Serves as Division Head or Senior Technical Staff responsible for HSI personnel.	4.1	1.21	1.10	5	2	2	1	0	4
Forecast competency demand signals for HSI.	4	0.75	0.87	3	3	3	0	0	4
Author peer-reviewed journal articles on HSI.	4	1.11	1.05	4	3	2	1	0	4
Developing KSA and assignment/experience requirements for HSI.	3.78	1.44	1.20	2	5	1	0	1	4
Knowledge Skills and Abilities Entry Level (1)	**Average Importance**	**Variance**	**SD**	**Importance Frequency**					**Assigned Level**
				5	**4**	**3**	**2**	**1**	
A beginning knowledge of purpose and process of technical analyses.	4.3	0.90	0.95	5	4	0	1	0	1
Completion of DAU Acquisition 101 (web based) for all competency personnel.	4.2	1.07	1.03	5	3	1	1	0	1
Know the acquisition process/policy.	4.1	0.54	0.74	3	5	2	0	0	1
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.	4.1	0.99	0.99	4	4	1	1	0	1
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	4	0.67	0.82	2	7	0	1	0	1

Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	4	0.89	0.94	3	5	1	1	0	1
Undergraduate degree in Engineering or HSI-related area.	4	1.78	1.33	5	2	2	0	1	1
Understanding of Human Systems Integration Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	3.9	0.77	0.88	2	6	1	1	0	1
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).	3.78	2.19	1.48	4	2	1	1	1	1
Fundamental cognizance of Applied Psychology relative to knowledge engineering, training, team work, user interface design and decision sciences.	3.4	1.16	1.07	1	5	1	3	0	1
Knowledge Skills and Abilities Intermediate Level (2)	**Average Importance**	**Variance**	**SD**	**Importance Frequency**					**Assigned Level**
				5	**4**	**3**	**2**	**1**	
Understanding of HSI domain levels and their relationship with acquisition and systems engineering processes.	4.5	0.28	0.53	5	5	0	0	0	2
Knowledge of human performance measurement and ability to measure it.	4.3	0.23	0.48	3	7	0	0	0	2
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	4.3	0.46	0.67	4	5	1	0	0	2
Completion of Level 2 DAWIA/SPRDE - SE requirements (as required).	4.11	1.11	1.05	4	3	1	1	0	2

Familiar with organizational structure and current status of the user community which they are currently assigned to support.	4.1	0.77	0.88	4	3	3	0	0	2
In-depth knowledge of domain levels.	4.1	0.54	0.74	3	5	2	0	0	2
Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.	3.9	0.32	0.57	1	7	2	0	0	2
Systems Engineering Certificate (desired).	3.56	1.28	1.13	2	3	2	2	0	2
HSI Certificate.	3.22	1.19	1.09	1	2	5	0	1	2
Knowledge Skills and Abilities Advanced Level (3)	**Average Importance**	**Variance**	**SD**	**Importance Frequency**					**Assigned Level**
				5	**4**	**3**	**2**	**1**	
Familiar with challenges, needs and objectives facing the user community which they serve to include arrangement and order of commands to which they are subordinate.	4.67	0.25	0.50	6	3	0	0	0	3
Ability to manage resources, assess and manage HSI impacts and risks, and evaluate and provide HSI inputs to contract clauses, deliverables, and budgets.	4.6	0.27	0.52	6	4	0	0	0	3
Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.	4.56	0.28	0.53	5	4	0	0	0	3
In-depth and working level knowledge of systems engineering, human systems integration, and program/project management	4.5	0.28	0.53	5	5	0	0	0	3

Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.	4.5	0.28	0.53	5	5	0	0	0	3
Detailed knowledge of Acquisition Process, including Systems Engineering, Logistics, PPBE, and JCIDS.	4.5	0.50	0.71	6	3	1	0	0	3
Completion of an advanced technical degree, MS-SE, MS-HSI, or related degree. (desired).	4.2	0.18	0.42	2	8	0	0	0	3
Leadership development (ombudsman/ alliance development for influence in HSI community).	4.1	0.32	0.57	2	7	1	0	0	3
Completion of project management training and/or industry certification, such as project management professional (desired).	3.8	0.40	0.63	1	6	3	0	0	3
Knowledge of law and Government, relating to acquisition and human capital management.	3.78	0.44	0.67	1	5	3	0	0	3
Knowledge Skills and Abilities Expert Level (4)	**Average Importance**	**Variance**	**SD**	**Importance Frequency**					**Assigned Level**
				5	**4**	**3**	**2**	**1**	
Completion of advanced degree or continuing education, related to acquisition management, systems engineering, human systems integration, supply chain management, or human resource/capital management (desired).	4.89	0.11	0.33	8	1	0	0	0	4
Participates in continued technical education.	4.67	0.25	0.50	6	3	0	0	0	4
Post MS courses in SE and HSI (desired).	4	0.75	0.87	2	6	0	1	0	4
Completed Executive Management Training (desired).	3.78	0.94	0.97	2	4	2	1	0	4

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APPENDIX C. FSS ACQUISITION DOMAIN ASSIGNMENT

Note: Bold type indicates 50% or more significantly agreed on the domain placement.

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
AE Level 1																
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	**79.2**	**16.7**	**4.2**	**0.0**	**0.0**	**24**	**0.93**	**0.53**	**0.43**	**0.05**	**0.28**	**0.00**	**0.22**	**0.00**	**0.22**	**0.00**
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	**66.7**	**29.2**	**4.2**	**0.0**	**0.0**	**24**	**0.85**	**0.41**	**0.55**	**0.12**	**0.28**	**0.00**	**0.22**	**0.00**	**0.22**	**0.00**
Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	43.5	26.1	30.4	0.0	0.0	23	0.68	0.21	0.53	0.10	0.57	0.13	0.22	0.00	0.22	0.00
Experience in executing tasking using HSI standards, best practices, and other techniques.	**75.0**	**20.8**	**4.2**	**0.0**	**0.0**	**24**	**0.90**	**0.49**	**0.47**	**0.07**	**0.28**	**0.00**	**0.22**	**0.00**	**0.22**	**0.00**
Experience with cost control, configuration management, design reviews, and life-cycle perspectives.	25.0	25.0	50.0	0.0	0.0	24	0.51	0.10	0.51	0.10	0.73	0.27	0.22	0.00	0.22	0.00
Performance/Demonstration (3 years experience): Participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing systems engineering procurement package development, evaluating and reporting on Contract Data Requirements List (CDRL) input from contractors. Skilled in analysis techniques, including Gap, Trade-Off, and Trade Space Analyses. Ability to conduct studies and analyze results.	39.1	60.9	0.0	0.0	0.0	23	0.65	0.18	0.82	0.35	0.22	0.00	0.22	0.00	0.22	0.00

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
AE Level 2																
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.	**75.0**	**15.0**	**10.0**	**0.0**	**0.0**	**20**	**0.91**	**0.46**	**0.44**	**0.04**	**0.38**	**0.02**	**0.25**	**0.00**	**0.25**	**0.00**
Participate in a cross-domain IPT.	47.6	38.1	9.5	0.0	4.8	21	0.73	0.24	0.65	0.17	0.37	0.02	0.24	0.00	0.31	0.01
Provide technical leadership for HSI deliverables within an IPT.	**81.0**	**9.5**	**9.5**	**0.0**	**0.0**	**21**	**0.94**	**0.53**	**0.37**	**0.02**	**0.37**	**0.02**	**0.24**	**0.00**	**0.24**	**0.00**
Increase exposure to other competencies. Providing support to a non-HSI competency effort to produce an IPT deliverable.	40.0	35.0	10.0	0.0	15.0	20	0.67	0.18	0.63	0.15	0.38	0.02	0.25	0.00	0.44	0.04
Perform interface with the fleet customer or sponsor on technical issues.	33.3	47.6	19.0	0.0	0.0	21	0.61	0.14	0.73	0.24	0.47	0.06	0.24	0.00	0.24	0.00
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.	**85.7**	**4.8**	**4.8**	**0.0**	**4.8**	**21**	**0.96**	**0.58**	**0.31**	**0.01**	**0.31**	**0.01**	**0.24**	**0.00**	**0.31**	**0.01**
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.	23.8	23.8	14.3	28.6	9.5	21	0.52	0.08	0.52	0.08	0.42	0.04	0.56	0.11	0.37	0.02
Applies Engineering and Psychology as it relates to knowledge engineering, training, teamwork, and user interface design and decision sciences to properly influence relevant documentation.	**70.0**	**15.0**	**0.0**	**15.0**	**0.0**	**20**	**0.88**	**0.42**	**0.44**	**0.04**	**0.25**	**0.00**	**0.44**	**0.04**	**0.25**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Intermediate Level Learning/OJT (e.g. Mature level of hands-on participating, mentoring Entry Level, and further developing KSAs in Systems Engineering, Logistics, Project Management, Acquisition, and Supply Support.)	28.6	23.8	19.0	0.0	28.6	21	0.56	0.11	0.52	0.08	0.47	0.06	0.24	0.00	0.56	0.11
Performance/Demonstration (10 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing SE procurement package development, evaluating and reporting on CDRL input from contractors.	30.0	65.0	5.0	0.0	0.0	20	0.58	0.12	0.85	0.37	0.32	0.01	0.25	0.00	0.25	0.00
AE Level 3																
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.	**90.0**	**0.0**	**10.0**	**0.0**	**0.0**	**20**	**0.98**	**0.62**	**0.25**	**0.00**	**0.38**	**0.02**	**0.25**	**0.00**	**0.25**	**0.00**
Serve as a HSI technical consultant and advisor for a particular technology area.	**95.0**	**5.0**	**0.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**
Experience providing HSI technology projections for a particular area.	**85.7**	**4.8**	**4.8**	**4.8**	**0.0**	**21**	**0.96**	**0.58**	**0.31**	**0.01**	**0.31**	**0.01**	**0.31**	**0.01**	**0.24**	**0.00**
Experience with technology transition.	19.0	28.6	14.3	38.1	0.0	21	0.47	0.06	0.56	0.11	0.42	0.04	0.65	0.17	0.24	0.00
Experience dealing directly with the customer or end-user.	28.6	19.0	42.9	0.0	9.5	21	0.56	0.11	0.47	0.06	0.69	0.20	0.24	0.00	0.37	0.02
Performance of technical mentoring for other HSI Competency assigned personnel.	**95.0**	**5.0**	**0.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Leadership of a Community of Interest or Mission Area Team (desired).	28.6	19.0	19.0	14.3	19.0	21	0.56	0.11	0.47	0.06	0.47	0.06	0.42	0.04	0.47	0.06
Participation on a cross-SYSCOM IPT, significant work with organizations to address technical challenges (desired).	19.0	57.1	9.5	9.5	4.8	21	0.47	0.06	0.80	0.31	0.37	0.02	0.37	0.02	0.31	0.01
Demonstrate advanced oral and written skills by authoring/co-authoring peer-reviewed journal articles, briefings to senior executives, etc.	30.0	15.0	5.0	30.0	20.0	20	0.58	0.12	0.44	0.04	0.32	0.01	0.58	0.12	0.49	0.06
Serve as the lead of an HSI team/project for 1 year.	**80.0**	**10.0**	**10.0**	**0.0**	**0.0**	**20**	**0.94**	**0.51**	**0.38**	**0.02**	**0.38**	**0.02**	**0.25**	**0.00**	**0.25**	**0.00**
Participate on a source selection panel for a competitive contract (desired).	30.0	50.0	15.0	0.0	5.0	20	0.58	0.12	0.75	0.25	0.44	0.04	0.25	0.00	0.32	0.01
Designation as an HSI Technical Warrant Holder (desired).	**95.0**	**5.0**	**0.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**
Aligns HSI efforts to support objectives on behalf of the war fighter.	**81.0**	**9.5**	**9.5**	**0.0**	**0.0**	**21**	**0.94**	**0.53**	**0.37**	**0.02**	**0.37**	**0.02**	**0.24**	**0.00**	**0.24**	**0.00**
Works to improve the DAWIA/SPRDE-SE process regarding HSI practices.	**85.0**	**10.0**	**0.0**	**0.0**	**5.0**	**20**	**0.96**	**0.56**	**0.38**	**0.02**	**0.25**	**0.00**	**0.25**	**0.00**	**0.32**	**0.01**
Demonstrates authoritative implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.	**80.0**	**15.0**	**5.0**	**0.0**	**0.0**	**20**	**0.94**	**0.51**	**0.44**	**0.04**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Demonstrates Advanced on the job experience. Consultation/mentorship improved HSI products and tools, managing Entry and Intermediate level HSI staffs.	**85.7**	**4.8**	**4.8**	**0.0**	**4.8**	**21**	**0.96**	**0.58**	**0.31**	**0.01**	**0.31**	**0.01**	**0.24**	**0.00**	**0.31**	**0.01**
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, discussion panels.	**80.0**	**10.0**	**0.0**	**5.0**	**5.0**	**20**	**0.94**	**0.51**	**0.38**	**0.02**	**0.25**	**0.00**	**0.32**	**0.01**	**0.32**	**0.01**
AE Level 4																
Create technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.	19.0	28.6	4.8	47.6	0.0	21	0.47	0.06	0.56	0.11	0.31	0.01	0.73	0.24	0.24	0.00
Forecast competency demand signals for HSI.	**90.0**	**10.0**	**0.0**	**0.0**	**0.0**	**20**	**0.98**	**0.62**	**0.38**	**0.02**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**
Develop and implement strategic vision for HSI.	**95.0**	**5.0**	**0.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**
Developing KSA and assignment/experience requirements for HSI.	**90.0**	**5.0**	**0.0**	**5.0**	**0.0**	**20**	**0.98**	**0.62**	**0.32**	**0.01**	**0.25**	**0.00**	**0.32**	**0.01**	**0.25**	**0.00**
Author peer-reviewed journal articles on HSI.	**95.0**	**0.0**	**0.0**	**5.0**	**0.0**	**20**	**0.99**	**0.68**	**0.25**	**0.00**	**0.25**	**0.00**	**0.32**	**0.01**	**0.25**	**0.00**
Assigned as a Technical Area Expert in HSI.	**95.2**	**4.8**	**0.0**	**0.0**	**0.0**	**21**	**0.99**	**0.69**	**0.31**	**0.01**	**0.24**	**0.00**	**0.24**	**0.00**	**0.24**	**0.00**
HSI competency lead.	**100.0**	**0.0**	**0.0**	**0.0**	**0.0**	**20**	**1.00**	**0.75**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**
Nationally recognized leader in HSI.	**95.0**	**5.0**	**0.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**	**0.25**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.	**95.0**	**0.0**	**5.0**	**0.0**	**0.0**	**20**	**0.99**	**0.68**	**0.25**	**0.00**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**
Serves as Division Head or Senior Technical Staff responsible for HSI personnel.	50.0	25.0	10.0	0.0	15.0	20	0.75	0.25	0.54	0.09	0.38	0.02	0.25	0.00	0.44	0.04
Answers HSI needs and objectives of the user community.	**90.5**	**0.0**	**9.5**	**0.0**	**0.0**	**21**	**0.98**	**0.63**	**0.24**	**0.00**	**0.37**	**0.02**	**0.24**	**0.00**	**0.24**	**0.00**
Approval authority for meeting DAWIA requirements within the HSI competency.	**75.0**	**15.0**	**0.0**	**0.0**	**10.0**	**20**	**0.91**	**0.46**	**0.44**	**0.04**	**0.25**	**0.00**	**0.25**	**0.00**	**0.38**	**0.02**
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.	**85.0**	**5.0**	**5.0**	**0.0**	**5.0**	**20**	**0.96**	**0.56**	**0.32**	**0.01**	**0.32**	**0.01**	**0.25**	**0.00**	**0.32**	**0.01**
KSA Level 1																
Undergraduate degree in Engineering or HSI-related area.	47.4	47.4	0.0	5.3	0.0	19	0.73	0.23	0.73	0.23	0.26	0.00	0.33	0.01	0.26	0.00
Knowledge of the acquisition process/policy.	21.1	42.1	31.6	0.0	5.3	19	0.51	0.06	0.69	0.19	0.60	0.12	0.26	0.00	0.33	0.01
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	63.2	36.8	0.0	0.0	0.0	19	0.85	0.35	0.65	0.15	0.26	0.00	0.26	0.00	0.26	0.00
A beginning knowledge of purpose and process of technical analyses.	**10.0**	**70.0**	**5.0**	**15.0**	**0.0**	**20**	**0.38**	**0.02**	**0.88**	**0.42**	**0.32**	**0.01**	**0.44**	**0.04**	**0.25**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	35.0	25.0	30.0	0.0	10.0	20	0.63	0.15	0.54	0.09	0.58	0.12	0.25	0.00	0.38	0.02
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.	20.0	25.0	25.0	0.0	30.0	20	0.49	0.06	0.54	0.09	0.54	0.09	0.25	0.00	0.58	0.12
Completion of DAU Acquisition 101 (web based) for all competency personnel.	21.1	52.6	15.8	0.0	10.5	19	0.51	0.06	0.77	0.27	0.45	0.04	0.26	0.00	0.39	0.02
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).	**15.8**	**78.9**	**0.0**	**5.3**	**0.0**	**19**	**0.45**	**0.04**	**0.94**	**0.49**	**0.26**	**0.00**	**0.33**	**0.01**	**0.26**	**0.00**
Fundamental cognizance of Applied Engineering/ Psychology relative to user interface design and decision sciences.	63.2	21.1	0.0	15.8	0.0	19	0.85	0.35	0.51	0.06	0.26	0.00	0.45	0.04	0.26	0.00
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	**84.2**	**10.5**	**0.0**	**5.3**	**0.0**	**19**	**0.96**	**0.55**	**0.39**	**0.02**	**0.26**	**0.00**	**0.33**	**0.01**	**0.26**	**0.00**
KSA Level 2																
HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)	**88.9**	**11.1**	**0.0**	**0.0**	**0.0**	**18**	**0.98**	**0.59**	**0.41**	**0.02**	**0.27**	**0.00**	**0.27**	**0.00**	**0.27**	**0.00**
Systems Engineering Certificate (desired). (NPS four course certificate program)	**5.6**	**88.9**	**0.0**	**5.6**	**0.0**	**18**	**0.34**	**0.01**	**0.98**	**0.59**	**0.27**	**0.00**	**0.34**	**0.01**	**0.27**	**0.00**
In-depth knowledge of job related HSI domain levels.	**94.4**	**5.6**	**0.0**	**0.0**	**0.0**	**18**	**0.99**	**0.66**	**0.34**	**0.01**	**0.27**	**0.00**	**0.27**	**0.00**	**0.27**	**0.00**

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Understanding of HSI domain relationships with acquisition and the systems engineering processes.	61.1	38.9	0.0	0.0	0.0	18	0.84	0.33	0.67	0.16	0.27	0.00	0.27	0.00	0.27	0.00
Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.	**16.7**	**11.1**	**72.2**	**0.0**	**0.0**	**18**	**0.47**	**0.04**	**0.41**	**0.02**	**0.90**	**0.42**	**0.27**	**0.00**	**0.27**	**0.00**
Knowledge of human performance measurement and ability to measure it.	**72.2**	**5.6**	**0.0**	**16.7**	**5.6**	**18**	**0.90**	**0.42**	**0.34**	**0.01**	**0.27**	**0.00**	**0.47**	**0.04**	**0.34**	**0.01**
Familiar with organizational structure and current status of the user community, which they support.	33.3	16.7	27.8	0.0	22.2	18	0.63	0.13	0.47	0.04	0.58	0.10	0.27	0.00	0.53	0.07
Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).	**11.1**	**83.3**	**0.0**	**0.0**	**5.6**	**18**	**0.41**	**0.02**	**0.96**	**0.53**	**0.27**	**0.00**	**0.27**	**0.00**	**0.34**	**0.01**
KSA Level 3																
Completion of an advanced technical degree, MS-SE, MS-HSI, or related advanced degree (desired).	55.6	27.8	0.0	0.0	16.7	18	0.80	0.28	0.58	0.10	0.27	0.00	0.27	0.00	0.47	0.04
In-depth and working level knowledge of SE, HSI, and program/project management	44.4	16.7	22.2	0.0	16.7	18	0.72	0.20	0.47	0.04	0.53	0.07	0.27	0.00	0.47	0.04
Leadership development (alliance development for influence in HSI community).	55.6	11.1	22.2	0.0	11.1	18	0.80	0.28	0.41	0.02	0.53	0.07	0.27	0.00	0.41	0.02
Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.	22.2	66.7	0.0	0.0	11.1	18	0.53	0.07	0.87	0.37	0.27	0.00	0.27	0.00	0.41	0.02

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Completion of project management training and/or industry certification, such as project management professional (desired).	5.6	0.0	94.4	0.0	0.0	18	0.34	0.01	0.27	0.00	0.99	0.66	0.27	0.00	0.27	0.00
Detailed knowledge of Acquisition Process, including Systems Engineering, Logistics, PPBE, and JCIDS.	22.2	27.8	33.3	0.0	16.7	18	0.53	0.07	0.58	0.10	0.63	0.13	0.27	0.00	0.47	0.04
Knowledge of law and Government, relating to acquisition and human capital management.	16.7	0.0	61.1	0.0	22.2	18	0.47	0.04	0.27	0.00	0.84	0.33	0.27	0.00	0.53	0.07
Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.	33.3	5.6	55.6	0.0	5.6	18	0.63	0.13	0.34	0.01	0.80	0.28	0.27	0.00	0.34	0.01
Ability to manage resources, assess and manage HSI impacts and risks, and evaluate and provide HSI inputs to contract clauses, deliverables, and budgets.	61.1	0.0	38.9	0.0	0.0	18	0.84	0.33	0.27	0.00	0.67	0.16	0.27	0.00	0.27	0.00
Familiar with challenges, needs and objectives facing the user community which they serve to include arrangement and order of commands to which they are subordinate.	22.2	11.1	44.4	0.0	22.2	18	0.53	0.07	0.41	0.02	0.72	0.20	0.27	0.00	0.53	0.07
KSA Level 4																
Completed Executive Management Training (desired).	5.6	5.6	83.3	0.0	5.6	18	0.34	0.01	0.34	0.01	0.96	0.53	0.27	0.00	0.34	0.01

Meta-competencies	% HSI	% SE	% PM	% S&T	% Other	Response Count	HSI		SE		PM		S&T		Other	
							95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Post MS courses in SE and HSI (desired).	55.6	27.8	0.0	0.0	16.7	18	0.80	0.28	0.58	0.10	0.27	0.00	0.27	0.00	0.47	0.04
Participates in continued technical education.	29.4	29.4	0.0	5.9	35.3	17	0.60	0.10	0.60	0.10	0.28	0.00	0.36	0.01	0.65	0.14

APPENDIX D. FSS WORK-LEVEL ASSIGNMENT

Note: Bold type indicates 50% or more significantly agreed on the work level placement.

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
AE Level 1													
Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	25.0	54.2	16.7	4.2	24	0.50	0.10	0.76	0.31	0.42	0.05	0.27	0.01
Experience developing / refining HSI requirements, building to those requirements, and testing to requirements.	16.7	50.0	29.2	4.2	24	0.42	0.05	0.73	0.27	0.55	0.12	0.27	0.01
Participate in the drafting of contract documentation (statement of work, government estimates, etc.) for HSI.	8.7	56.5	34.8	0.0	23	0.33	0.02	0.78	0.32	0.60	0.16	0.21	0.00
Experience in executing tasking using HSI standards, best practices, and other techniques.	37.5	37.5	16.7	8.3	24	0.62	0.18	0.62	0.18	0.42	0.05	0.32	0.02
Experience with cost control, configuration management, design reviews, and life-cycle perspectives.	8.3	58.3	33.3	0.0	24	0.32	0.02	0.79	0.34	0.58	0.15	0.21	0.00
Performance/Demonstration (3 years experience): Participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing systems engineering procurement package development, evaluating and reporting on Contract Data Requirements List (CDRL) input from contractors. Skilled in analysis techniques, including Gap, Trade-Off, and Trade Space Analyses. Ability to conduct studies and analyze results.	4.3	52.2	30.4	13.0	23	0.28	0.01	0.75	0.29	0.56	0.13	0.38	0.03

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
AE Level 2													
Experience performing HSI technical, cost, schedule, and risk trade-off analysis in support of HSI deliverables for the IPT.	**0.0**	**70.0**	**25.0**	**5.0**	**20**	**0.24**	**0.00**	**0.88**	**0.42**	**0.53**	**0.09**	**0.31**	**0.01**
Participate in a cross-domain IPT.	33.3	57.1	9.5	0.0	21	0.60	0.14	0.79	0.32	0.36	0.02	0.23	0.00
Provide technical leadership for HSI deliverables within an IPT.	4.8	57.1	38.1	0.0	21	0.30	0.01	0.79	0.32	0.64	0.17	0.23	0.00
Increase exposure to other competencies. Providing support to a non-HSI competency effort to produce an IPT deliverable.	15.0	55.0	25.0	5.0	20	0.43	0.04	0.78	0.30	0.53	0.09	0.31	0.01
Perform interface with the fleet customer or sponsor on technical issues.	9.5	52.4	33.3	4.8	21	0.36	0.02	0.76	0.28	0.60	0.14	0.30	0.01
Experience or training performing HSI activities in operational venues and understanding of operational effects of HSI decisions.	14.3	42.9	28.6	14.3	21	0.41	0.04	0.68	0.21	0.56	0.11	0.41	0.04
Demonstrate intermediate oral and written skills through contributions to a published journal article, presentations to sponsors, etc.	**14.3**	**66.7**	**14.3**	**4.8**	**21**	**0.41**	**0.04**	**0.86**	**0.40**	**0.41**	**0.04**	**0.30**	**0.01**
Applies Engineering and Psychology as it relates to knowledge engineering, training, teamwork, and user interface design and decision sciences to properly influence relevant documentation.	20.0	40.0	30.0	10.0	20	0.48	0.06	0.66	0.18	0.58	0.12	0.37	0.02

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Intermediate Level Learning/OJT (e.g. Mature level of hands-on participating, mentoring Entry Level, and further developing KSAs in Systems Engineering, Logistics, Project Management, Acquisition, and Supply Support.)	4.8	57.1	33.3	4.8	21	0.30	0.01	0.79	0.32	0.60	0.14	0.30	0.01
Performance/Demonstration (10 years experience): participating through documenting requirements, observing and participating as needed in a formal Top Down Analysis or equivalent process, performing SE procurement package development, evaluating and reporting on CDRL input from contractors.	0.0	40.0	40.0	20.0	20	0.24	0.00	0.66	0.18	0.66	0.18	0.48	0.06
AE Level 3													
Provide HSI technical leadership and guidance for a large IPT or as part of an IPT supporting a significant effort.	0.0	10.0	60.0	30.0	20	0.24	0.00	0.37	0.02	0.82	0.34	0.58	0.12
Serve as a HSI technical consultant and advisor for a particular technology area.	0.0	25.0	45.0	30.0	20	0.24	0.00	0.53	0.09	0.70	0.22	0.58	0.12
Experience providing HSI technology projections for a particular area.	0.0	28.6	61.9	9.5	21	0.23	0.00	0.56	0.11	0.83	0.36	0.36	0.02
Experience with technology transition.	0.0	52.4	33.3	14.3	21	0.23	0.00	0.76	0.28	0.60	0.14	0.41	0.04
Experience dealing directly with the customer or end-user.	14.3	52.4	28.6	4.8	21	0.41	0.04	0.76	0.28	0.56	0.11	0.30	0.01
Performance of technical mentoring for other HSI Competency assigned personnel.	**5.0**	**15.0**	**70.0**	**10.0**	**20**	**0.31**	**0.01**	**0.43**	**0.04**	**0.88**	**0.42**	**0.37**	**0.02**

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Leadership of a Community of Interest or Mission Area Team (desired).	0.0	19.0	57.1	23.8	21	0.23	0.00	0.46	0.06	0.79	0.32	0.51	0.09
Participation on a cross-SYSCOM IPT, significant work with organizations to address technical challenges (desired).	0.0	33.3	52.4	14.3	21	0.23	0.00	0.60	0.14	0.76	0.28	0.41	0.04
Demonstrate advanced oral and written skills by authoring/co-authoring peer-reviewed journal articles, briefings to senior executives, etc.	0.0	30.0	55.0	15.0	20	0.24	0.00	0.58	0.12	0.78	0.30	0.43	0.04
Serve as the lead of an HSI team/project for 1 year.	0.0	65.0	35.0	0.0	20	0.24	0.00	0.85	0.38	0.62	0.15	0.24	0.00
Participate on a source selection panel for a competitive contract (desired).	0.0	30.0	65.0	5.0	20	0.24	0.00	0.58	0.12	0.85	0.38	0.31	0.01
Designation as an HSI Technical Warrant Holder (desired).	**0.0**	**10.0**	**5.0**	**85.0**	**20**	**0.24**	**0.00**	**0.37**	**0.02**	**0.31**	**0.01**	**0.96**	**0.57**
Aligns HSI efforts to support objectives on behalf of the war fighter.	4.8	28.6	47.6	19.0	21	0.30	0.01	0.56	0.11	0.72	0.24	0.46	0.06
Works to improve the DAWIA/SPRDE-SE process regarding HSI practices.	5.0	10.0	40.0	45.0	20	0.31	0.01	0.37	0.02	0.66	0.18	0.70	0.22
Demonstrates authoritative implementation of relevant instructions, notices, and directives to consistently improve and adapt HSI to answer requirements of the war fighter.	0.0	20.0	45.0	35.0	20	0.24	0.00	0.48	0.06	0.70	0.22	0.62	0.15

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Demonstrates Advanced on the job experience. Consultation/mentorship improved HSI products and tools, managing Entry and Intermediate level HSI staffs.	4.8	9.5	61.9	23.8	21	0.30	0.01	0.36	0.02	0.83	0.36	0.51	0.09
Performance/Demonstration (15 years experience): Integrating the science and processes among all levels of organization; actively participating on leadership teams reviewing and modifying existing or developing new HSI policy; participating in technical conferences, discussion panels.	**0.0**	**5.0**	**25.0**	**70.0**	**20**	**0.24**	**0.00**	**0.31**	**0.01**	**0.53**	**0.09**	**0.88**	**0.42**
AE Level 4													
Create technical solutions that have not previously existed, making significant contributions that impact future Naval capabilities.	0.0	9.5	38.1	52.4	21	0.23	0.00	0.36	0.02	0.64	0.17	0.76	0.28
Forecast competency demand signals for HSI.	0.0	5.0	60.0	35.0	20	0.24	0.00	0.31	0.01	0.82	0.34	0.62	0.15
Develop and implement strategic vision for HSI.	**0.0**	**5.0**	**20.0**	**75.0**	**20**	**0.24**	**0.00**	**0.31**	**0.01**	**0.48**	**0.06**	**0.91**	**0.47**
Developing KSA and assignment/experience requirements for HSI.	0.0	10.0	45.0	45.0	20	0.24	0.00	0.37	0.02	0.70	0.22	0.70	0.22
Author peer-reviewed journal articles on HSI.	5.0	25.0	55.0	15.0	20	0.31	0.01	0.53	0.09	0.78	0.30	0.43	0.04
Assigned as a Technical Area Expert in HSI.	4.8	14.3	28.6	52.4	21	0.30	0.01	0.41	0.04	0.56	0.11	0.76	0.28
HSI competency lead.	0.0	10.0	35.0	55.0	20	0.24	0.00	0.37	0.02	0.62	0.15	0.78	0.30
Nationally recognized leader in HSI.	**0.0**	**5.0**	**10.0**	**85.0**	**20**	**0.24**	**0.00**	**0.31**	**0.01**	**0.37**	**0.02**	**0.96**	**0.57**

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Sought both within and outside Command on input to HSI policy, specifications, standards, guidelines, issues/problem, and solutions.	**0.0**	**5.0**	**15.0**	**80.0**	**20**	**0.24**	**0.00**	**0.31**	**0.01**	**0.43**	**0.04**	**0.94**	**0.52**
Serves as Division Head or Senior Technical Staff responsible for HSI personnel.	0.0	5.0	40.0	55.0	20	0.24	0.00	0.31	0.01	0.66	0.18	0.78	0.30
Answers HSI needs and objectives of the user community.	0.0	19.0	61.9	19.0	21	0.23	0.00	0.46	0.06	0.83	0.36	0.46	0.06
Approval authority for meeting DAWIA requirements within the HSI competency.	0.0	5.0	35.0	60.0	20	0.24	0.00	0.31	0.01	0.62	0.15	0.82	0.34
Demonstrates nonparallel execution of HSI; cognizant of emergent challenges facing the various war fighter communities.	5.0	10.0	40.0	45.0	20	0.31	0.01	0.37	0.02	0.66	0.18	0.70	0.22
KSA Level 1													
Undergraduate degree in Engineering or HSI-related area.	**94.7**	**5.3**	**0.0**	**0.0**	**19**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**
Knowledge of the acquisition process/policy.	**68.4**	**21.1**	**10.5**	**0.0**	**19**	**0.87**	**0.40**	**0.50**	**0.07**	**0.38**	**0.02**	**0.25**	**0.00**
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	52.6	42.1	5.3	0.0	19	0.77	0.27	0.69	0.19	0.32	0.01	0.25	0.00
A beginning knowledge of purpose and process of technical analyses.	**90.0**	**10.0**	**0.0**	**0.0**	**20**	**0.98**	**0.63**	**0.37**	**0.02**	**0.24**	**0.00**	**0.24**	**0.00**

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Understanding of other disciplines: other engineering disciplines, logistics, project management, contracts, testing and evaluation.	**60.0**	**35.0**	**5.0**	**0.0**	**20**	**0.82**	**0.34**	**0.62**	**0.15**	**0.31**	**0.01**	**0.24**	**0.00**
Basic familiarity with organizational structure and current status of the user community which they are currently assigned to support.	**80.0**	**15.0**	**0.0**	**5.0**	**20**	**0.94**	**0.52**	**0.43**	**0.04**	**0.24**	**0.00**	**0.31**	**0.01**
Completion of DAU Acquisition 101 (web based) for all competency personnel.	**94.7**	**5.3**	**0.0**	**0.0**	**19**	**0.99**	**0.68**	**0.32**	**0.01**	**0.25**	**0.00**	**0.25**	**0.00**
Completion of Level 1 DAIWA/SPRDE-SE requirements (as required).	89.5	10.5	0.0	0.0	19	0.98	0.62	0.38	0.02	0.25	0.00	0.25	0.00
Fundamental cognizance of Applied Engineering/ Psychology relative to user interface design and decision sciences.	68.4	31.6	0.0	0.0	19	0.87	0.40	0.60	0.13	0.25	0.00	0.25	0.00
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	52.6	47.4	0.0	0.0	19	0.77	0.27	0.73	0.23	0.25	0.00	0.25	0.00
KSA Level 2													
HSI Certificate. (Naval Postgraduate School (NPS) four course certificate program)	**16.7**	**77.8**	**5.6**	**0.0**	**18**	**0.46**	**0.04**	**0.93**	**0.48**	**0.33**	**0.01**	**0.26**	**0.00**
Systems Engineering Certificate (desired). (NPS four course certificate program)	**5.6**	**83.3**	**11.1**	**0.0**	**18**	**0.33**	**0.01**	**0.96**	**0.54**	**0.40**	**0.02**	**0.26**	**0.00**
In-depth knowledge of job related HSI domain levels.	16.7	50.0	33.3	0.0	18	0.46	0.04	0.75	0.25	0.62	0.13	0.26	0.00

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Understanding of HSI domain relationships with acquisition and the systems engineering processes.	16.7	66.7	16.7	0.0	18	0.46	0.04	0.87	0.38	0.46	0.04	0.26	0.00
Higher level of knowledge in project management: Negotiation, team building, leadership, strategic and critical thinking, and integration management.	11.1	38.9	50.0	0.0	18	0.40	0.02	0.67	0.17	0.75	0.25	0.26	0.00
Knowledge of human performance measurement and ability to measure it.	**11.1**	**72.2**	**11.1**	**5.6**	**18**	**0.40**	**0.02**	**0.90**	**0.43**	**0.40**	**0.02**	**0.33**	**0.01**
Familiar with organizational structure and current status of the user community, which they support.	27.8	66.7	5.6	0.0	18	0.57	0.10	0.87	0.38	0.33	0.01	0.26	0.00
Completion of Level 2 DAWIA/SPRDE-SE requirements (as required).	**0.0**	**94.4**	**5.6**	**0.0**	**18**	**0.26**	**0.00**	**0.99**	**0.67**	**0.33**	**0.01**	**0.26**	**0.00**
KSA Level 3													
Completion of an advanced technical degree, MS-SE, MS-HSI, or related advanced degree (desired).	0.0	38.9	61.1	0.0	18	0.26	0.00	0.67	0.17	0.83	0.33	0.26	0.00
In-depth and working level knowledge of SE, HSI, and program/project management	0.0	38.9	61.1	0.0	18	0.26	0.00	0.67	0.17	0.83	0.33	0.26	0.00
Leadership development (alliance development for influence in HSI community).	**0.0**	**16.7**	**77.8**	**5.6**	**18**	**0.26**	**0.00**	**0.46**	**0.04**	**0.93**	**0.48**	**0.33**	**0.01**
Completion of Level 3 DAWIA/SPRDE-SE requirements (as required). Related areas include Life-Cycle Logistics, Test and Evaluation, Program Management, and/or PPBE.	**0.0**	**22.2**	**72.2**	**5.6**	**18**	**0.26**	**0.00**	**0.52**	**0.07**	**0.90**	**0.43**	**0.33**	**0.01**

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Completion of project management training and/or industry certification, such as project management professional (desired).	0.0	44.4	55.6	0.0	18	0.26	0.00	0.71	0.21	0.79	0.29	0.26	0.00
Detailed knowledge of Acquisition Process, including Systems Engineering, Logistics, PPBE, and JCIDS.	0.0	33.3	61.1	5.6	18	0.26	0.00	0.62	0.13	0.83	0.33	0.33	0.01
Knowledge of law and Government, relating to acquisition and human capital management.	0.0	38.9	55.6	5.6	18	0.26	0.00	0.67	0.17	0.79	0.29	0.33	0.01
Skilled in risks management and mitigation strategies, resource allocation and coordination techniques, HSI planning and collaboration, project technical management, and workforce shaping and employee development.	**0.0**	**22.2**	**77.8**	**0.0**	**18**	**0.26**	**0.00**	**0.52**	**0.07**	**0.93**	**0.48**	**0.26**	**0.00**
Ability to manage resources, assess and manage HSI impacts and risks, and evaluate and provide HSI inputs to contract clauses, deliverables, and budgets.	0.0	33.3	66.7	0.0	18	0.26	0.00	0.62	0.13	0.87	0.38	0.26	0.00
Familiar with challenges, needs and objectives facing the user community which they serve to include arrangement and order of commands to which they are subordinate.	5.6	22.2	72.2	0.0	18	0.33	0.01	0.52	0.07	0.90	0.43	0.26	0.00
KSA Level 4													
Completed Executive Management Training (desired).	5.6	5.6	22.2	66.7	18	0.33	0.01	0.33	0.01	0.52	0.07	0.87	0.38

Meta-competencies	% Level 1	% Level 2	% Level 3	% Level 4	Response Count	Level 1		Level 2		Level 3		Level 4	
						95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI	95% Upper CI	95% Lower CI
Post MS courses in SE and HSI (desired).	0.0	0.0	61.1	38.9	18	0.26	0.00	0.26	0.00	0.83	0.33	0.67	0.17
Participates in continued technical education.	11.1	38.9	38.9	11.1	18	0.40	0.02	0.67	0.17	0.67	0.17	0.40	0.02

APPENDIX E. ENTRY LEVEL IDP

DEPARTMENT OF NAVY **INDIVIDUAL DEVELOPMENTAL PLAN**	*The Individual Development Plan serves as a career development roadmap and blue print for an individual to effectively plan and map out a career.*

SECTION I (*Employee Section*)

1. Name (Last, First, Middle Initial):	**2. Current Position Title:** **HSI Practitioner, Entry Level**	**3. SSN (***Last 4 digits)* _ _ _ _

4. Career Group and Pay Schedule and Band:	**5.** ☐ **Annual** ☐ **Midterm** ☐ **Final**	**6. Rating Period:** **From:** **To:**	**7. Mentor's Name/Title/Phone Number:** (***if applicable)***

8. Organization:	**9. Fiscal Year:** (***Funding year)***	**10. Date:**	**11. No further development desired or needed.** **Check here in the box** ☐

12. a. Career goal: (short term 1 to 3 years)	**12. b. Career goal: (long-term 3 years or more)**

13. a. Developmental Programs: I am in the following program ☐ Executive Development Leadership Program ☐ Executive Leadership Program ☐ HR Intern Program ☐ Career Program Intern ☐ SCEP ☐ Federal Executive Institute ☐ Presidential Management Fellow ☐ Defense Leadership and Management Program ☐ Supervisory Training Program ☐ ESTP ☐ Other

13. b. I want to be in the following program: ☐ Executive Development Leadership Program ☐ Executive Leadership Program ☐ HR Intern Program ☐ Career Program Intern ☐ SCEP ☐ Federal Executive Institute ☐ Presidential Management Fellow ☐ Defense Leadership and Management Program ☐ Supervisory Training Program ☐ ESTP ☐ Other

SECTION II (*Supervisor Section*)

14. Supervisor Notes/Comments:

SECTION III

15. Employee's Signature **Date**	**16. Supervisor's Signature** **Date**	**17.** ☐ Supervisor's Copy ☐ Employee's Copy ☐ Training Office Copy ☐ Mentor's Copy

SECTION IV (*Employee Section*)								
Developmental KSAs: 1= Professional 2=Personal 3=Leadership & Management 4=Certifications and Qualifications 5=Performance								
18. Developmental Objectives: (State the objective(s) to be achieved by linking it to the developmental activity or activities in as specific terms as possible. What knowledge, skills or abilities (KSAs) need to be obtained immediately to improve job performance?	**19. Developmental Activities:** (Developmental activities I will pursue: This may include On-the-job Training. Rotational Assignments, Developmental Projects, Self-Study Programs, Formal Training Programs, Correspondence Courses,	**20. KSA # (From above)**	**21. Critical/ Important/ Desired** DAWIA **Required?**	**22. Start Date**	**23. Completion Date**	**24. Direct Cost**	**25. Indirect Cost**	**26. Approved/ Disapproved**
Knowledge of the acquisition process/policy.	AE: Participate in the drafting of contract documentation.	**1**	Critical					
	AE: Experience with cost control, configuration management, design reviews & life cycle perspectives.	**1**	Critical					
	DAWIA: ACQ 101, Fundamentals of Systems Acquisition Management	**4**	Critical Required					
Undergraduate degree in Engineering or HSI-related area.	DAWIA Education: Baccalaureate or graduate degree in a technical or scientific field such as engineering, physics, chemistry, biology, mathematics, operations research, engineering management or computer science. Note: Civilians serving as an 0802 or 0856 must meet the OPM education requirements in lieu of this education standard.	**4**	Critical Required					
Knowledge of principles and practices relative to human performance to consistently improve and adapt HSI to answer requirements of the war fighter.	AE: Experience developing/refining HSI requirement, building to those requirements, and testing to those requirements.	**1**	Important					
	DAWIA Experience: 1 year of technical experience in an acquisition position from among the following career fields: SPRDE-SE, SPRDE-S&TM, IT, T&E, PQM, FE, PM or LCL	**1**	Critical Required					
Basic familiarity with organizational structure and current status of the user community, which they are currently assigned to support.	Through OJT, gain an understanding of the overall organizational structure and purpose for that structure. Be able to identify the user population, their current missions and the manner in which your position supports their mission.	**3**	Important					

Understanding of other disciplines: engineering disciplines, logistics, project management, contracts, testing and evaluation.	AE: Participate as an active IPT member for HSI and develop HSI deliverables for consideration by the IPT lead.	**1**	Important					
	DAWIA: CLM 017, Risk Management	**4**	Critical Required					
A beginning knowledge of purpose and process of technical analyses	Through OJT, work with the assigned mentor to review technical analyses.	**1**	Important					
	Core Plus: CLE 021, Technical Readiness Assessment	**4**	Desired					
Fundamental cognizance of Applied Psychology relative to knowledge engineering, training, teamwork, user interface design and decision sciences.	AE: Experience in executing taskings using HSI standards, best practices, and other techniques.	**5**	Important					
	Core Plus: CLE 009, ESOH in Systems Engineering	**4**	Desired					
	Core Plus: PQM 101, Production, Quality, and Manufacturing Fundamentals	**4**	Desired					
Understanding of HSI Process (Integrated Architecture), HSI policy, and Systems Engineering Technical Review (SETR) process.	DAWIA: SYS 101, Fundamentals of Systems Planning, Research, Development, and Engineering	**4**	Critical Required					

27. Relationship of Goals to Mission: ***Optional (My goals have organizational and personal relevance because):***
28. Achievement Review: ***Optional*** **(***This is how I will measure my progress):*

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